DOCUMENT RESUME

ED 107 874 CE 003 980

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TITLE	Occupational and Educational Structures of the Labor Force and Levels of Economic Development: Further Analyses and Statistical Data.
INSTITUTION	Organisation for Economic Cooperation and Development, Paris (France).
PUB DATE	71
NOTE	122p.; For the first volume, see ED 056 194
AVAILABLE FROM	OECD Publications Center, Suite 1207, 1750 Pennsylvania Avenue, N. W., Washington, D. C. 20006 ($3.00)
EDRS PRICE	MF-$0.76 PLUS POSTAGE. HC Not Available from EDRS.
DESCRIPTORS	Academic Achievement; Census Figures; *Educational Background; *Foreign Countries; *Labor Force; Multiple Regression Analysis; *Occupations; Participant Characteristics; Probability Theory; *Statistical Analysis; Statistical Data

ABSTRACT

The volume is the second of two and presents additional statistical analyses of data discussed in the first, which presented 1960 and 1961 census data from 53 countries in an attempt to identify and quantify factors which determined the occupational and educational structure of the labor force. The second volume consists of eight chapters: (1) a discussion on classification and aggregation problems; (2) supplementary analyses of the data in multiple regression models; (3) analyses of occupational and educational coefficients; (4) analyses of production function equations; (5) a short exposition of information theory as it relates to the aggregation problems in cross-classifications; (6) basic data used for the occupational analysis; (7) basic data used for the occupational/educational analysis; and (8) basic data used for the sectoral/educational analyses. (Author/MDW)

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ED107874

OCCUPATIONAL AND EDUCATIONAL STRUCTURES OF THE LABOUR FORCE AND LEVELS OF ECONOMIC DEVELOPMENT

Further analyses
and statistical data

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

This is the second of two volumes on "Occupational and Educational Structures of the Labour Force and Levels of Economic Development".

The first volume contained the analyses of the main relationships between education, occupation and development. This volume consists of a discussion on classification and aggregation problems (Annex A), supplementary analyses of the data by using multiple regression models (Annex B), followed by analyses of occupational and educational coefficients (Annex C) and production function equations (Annex D). It also contains a short exposition of information theory as this relates to the aggregation problem in cross-classifications (Annex E).

Lastly, three Annexes (F, G and H) show a listing of all the numerical observations used throughout the study.

This work was initiated and directed by Louis Emmerij. The bulk of the work has been carried out by Jean-Pierre Jallade, who can be considered as the major author of the study. Daniel Blot is the author of Annex E.

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Annex A

INTRODUCTION TO PROBLEMS OF CLASSIFICATION AND AGGREGATION

This Annex will be devoted to the problem which arises when international data are used, i.e., the comparability of the data available on the occupational and educational structures of the labour force which, in its turn, is related to the type of classification adopted in the various countries and the degree to which these classifications correspond to the specific needs of manpower-educational planning. Because of the differences in both classification and detail of the data available, and because one would wish to keep as many observations as possible, another problem has to be faced - the so-called aggregation problem. The discussion will be presented under three sub-headings: 1) classification problems related to the industrial-occupational matrices, dealing successively with the occupational classifications, the industrial classifications and the cross-classifications of occupational categories by sector of industrial activity; 2) classification problems related to the occupation-education matrices, dealing specifically with the problems relating to the educational classifications; and 3) problems of aggregation. The first two of these headings will introduce this question, which will be summarised and developed under the third heading.

As its title indicates, this Annex is concerned with a general introduction to these problem areas. Further specific indications were given, where necessary, in the relevant chapters of the first volume.

1. CLASSIFICATION PROBLEMS RELATED TO THE INDUSTRY-OCCUPATION MATRICES

These problems are related to the way in which countries have presented their information on the occupational structure of the labour force by sector of industrial activity. Two distinct classifications are therefore involved (the occupational and the industrial), on top of the

specific problem of how these two have been combined in the cross-tabulations. We are thus concerned respectively with the occupational classification, with the industrial classification, and with cross-classifying occupations by industry.

i) The occupational classification

The occupational distribution of the labour force can be considered as constituting the common denominator between on the one hand, the whole field of economic development and, on the other, the vast area of education and training. This statement indicates immediately the kind of conditions the occupational classification has to fulfil when one is concerned with manpower-educational planning problems*: ideally the classification adopted should make sense in terms of both economic development and educational and training requirements.

The problems raised when using a national occupational classification for purposes of national educational planning are multiplied when dealing with an international comparison of occupational structures in some 50 countries. These problems would be greater still if each country had devised its own classification, taking into account both its special development context and the specific objectives of the analysis. This, indeed, is the vicious circle in which one is caught when commenting on the relevance of the available classifications to an international comparison and to a specific analytical purpose. The international classifications which have been elaborated (and in the field of occupational structure the best known is, of course, the ISCO)** are multi-(analytical) purpose classifications which purport to be both broad and flexible enough to be applicable to countries at different levels of economic and social development. This obviously cannot be avoided, because of the risk of multiplying the number of international occupational classifications, one for each specific analytical purpose, and/or devising a different one for each group of countries within a given range of economic development. Such a multiplication would be very difficult, if not impossible, to handle for most national administrations. If it is, therefore, easy to criticize existing international classifications, they are better than nothing. This will become clear later in this chapter, when we discuss the educational classification for which no international standards exist as yet (although UNESCO is well advanced in elaborating one).

* The expression "manpower-educational planning" is being used here as shorthand for manpower analysis and forecasts for purposes of educational policy and planning, or, in other words, for purposes of quantifying the economic objectives of education as previously defined.

** International Standard Classification of Occupations, ILO, Geneva, 1958.

These observations have to be kept in mind when considering certain critical remarks in the pages which follow. Our discussion on the occupational classification will centre around two points: a) the deficiencies of ISCO for manpower-educational planning purposes; and b) the problems posed by countries which have adopted a different occupational classification.

a) ISCO and manpower-educational planning

The International Standard Classification of Occupations (ISCO) was developed over a number of years by the International Labour Organisation, assisted by the International Conference of Labour Statisticians. It was published for the first time in 1958 and was presented as "a comprehensive multi-purpose instrument for use in the organisation of occupational information". * The basic structure of this classification consists of 10 major groups, including the supplementary group X (workers not classifiable by occupation). ** The first four of these major groups correspond roughly to what are called "white-collar" or non-manual workers:

0 - professional, technical and related workers,

1 - administrative, executive and managerial workers,

2 - clerical workers,

3 - sales workers.

It is those non-manual categories upon which the occupational analysis of Part Two will mainly concentrate. For the sake of completeness, we also present the five major groups which could be roughly described as being "blue collar" or manual categories (we exclude therefore the above-mentioned major group X);

4 - farmers, fishermen, hunters, loggers and related workers,

5 - miners, quarrymen and related workers,

6 - workers in transport and communication occupations,

7/8 - craftsmen, production process workers and labourers, n.e.c.,

9 - service, sport and recreation workers.

The 10 major groups of ISCO are sub-divided into 73 minor groups (at the 2-digit level), 201 unit groups (3-digit level), and 1,345 occupations

* ISCO, op. cit., page iii.

** Members of the armed forces are included in a separate group.

(5-digits).* According to the introductory remarks of the ISCO, "it is believed that the use of the major and minor groups will provide significant data for general economic and social analysis. These, and the unit groups, appear particularly suitable for comparisons of census data. The occupations (5-digits) are expected to serve primarily in placement and for similarly administrative purposes".**

The period during which the ISCO was elaborated (1949-1957) explains to a certain extent why the manpower-educational planner often meets difficulties when using these data. The year of publication of the ISCO (1958) coincides with the emergence of the economics of education and the upsurge in educational planning activities. It would, therefore, be unfair to criticize ISCO for not having taken into consideration the specific needs of the manpower-educational planner during a period when leading works on economic development made only passing references, if any, to the importance of labour skills and of education in the development process.

However, certain criticisms of ISCO are of a more general nature. It has often been claimed that it confuses unduly such things as formal skill, job title, occupational status and functional and industrial affiliation in delimiting the occupations "in terms of the work customarily performed in most countries by the workers concerned".*** It has, therefore, been suggested that the classification should try to distinguish between the work functions actually performed and rank the occupations thus defined by formal and "informal" skill requirements which would reflect the degree of difficulty of the job. While such an approach would obviously present major problems of international consistency, the criticism (if valid) is an important one and would merit ample consideration.****

Others, and in the first instance ISCO itself, claim that the 5-digit occupations do indeed represent the functions performed. In the words of ISCO: "... the definitions provide descriptions of their functions, duties and tasks, and occupations of workers performing similar types of work are brought together in larger groups".***** H.S. Parnes agrees: "... since it (ISCO) includes detailed occupational definitions,

* These "occupations" at the 5-digit level are nevertheless still occupational groups. For example, the USA Dictionary of Occupational Titles (DOT) distinguishes around 20,000 occupations at its most detailed level of disaggregation.

** ISCO, op. cit., page 2.

*** ISCO, op. cit., page 2.

**** For a criticism of ISCO along these lines and a suggested new classification of white-collar jobs, see, for example, S. Jonasson "ISCO - A Critical Study, Suggestions for a Revised Structure", in Job Classification and Collective Bargaining, TCO International Seminar, Gallofsta, Sweden, 1966.

***** ISCO, op. cit., page 2.

it allows occupations to be classified on the basis of their functional content, thus minimising the difficulties that arise out of differences in the meaning of national occupational titles". *

These apparently contradictory views are based on the fact that the various authors are not talking at the same level of disaggregation. It is convenient to distinguish between a "vertical disaggregation" and a "horizontal disaggregation" problem. A psychologist who holds the job of a director of a publicity concern will be classified, according to ISCO, as a manager (major group 1) and not as a psychologist (major group 0). However, there is no way of knowing whether he is managing a firm of 10,000 employees or whether he is a "working proprietor" of a five-man bureau. This then is a "vertical disaggregation" problem: possibility to distinguish at one level, impossibility to do so at another level. The "horizontal disaggregation" problem creeps in when, for example, a person declares that he holds the occupation "engineer". The ISCO will rightly classify him in major group 0, minor group 0-0, and unit group 0-02. If, moreover, he declares that he is can electrical engineer, he will be classified in the 5-digit occupation 0-02.24. But if it is asked what the man is actually doing in the "occupation", there is no further answer one can give. He may be assigned to the research department of the firm, or he may be supervising a production line on the shop-floor, or he may be an inspector, etc., etc.; there is no way of knowing it within the framework of the ISCO.

The above considerations already impinge to a large extent upon the preoccupations of the manpower-educational planner, because these functional aspects clearly have educational and training implications. We shall, therefore, turn now to a general discussion of some claims and difficulties of the manpower-educational planner with regard to ISCO. As already mentioned, the ISCO is concerned much more with labour market analysis than with problems of manpower-educational planning. At the higher level of aggregation, the groupings frequently reflect much more socio-economic and/or economic sector criteria than anything else. Particularly upsetting is the fact already mentioned that so little attention has been paid to the skill requirements in various aggregations. Obviously any aggregation of occupations will inevitably raise objections. It may be asked, however, whether the functional homogeneity of major group 0 (professional, technical and related workers) is enhanced by including in it not only clergymen and religious workers, but also artists, dancers and TV announcers, besides such typically middle-level personnel as primary school teachers and technicians. The description of major group 0 in ISCO begins by stating that "many of the definitions of professional occupations refer to the possession by workers in the group concerned of a diploma or

* H.S. Parnes, op. cit., page 25.

university degree or equivalent qualification".* This is clearly an overstatement, as can be seen from the examples above and in Part Three of this study apropos the examination of the actually observed educational profiles of the various occupational groups. This heterogeneity can again be found at the 2-digit level; for example, minor group 0-0 includes not only engineers, who normally should have a university degree, but also surveyors, for whom this is frequently not the case. The same observation can be made for minor group 0-6 within which university teachers and primary school teachers are classified together. Even on the three-digit level (0-69), we still find secondary school and primary school teachers together.

This problem becomes a real handicap when the census data have only been processed up to the 2-digit level, as is sometimes the case, so that it becomes materially impossible to go into more detail. Even when more detailed data are potentially available, the tabulations published in the census documents rarely go beyond the 2-digit level. The type of codification adopted is, therefore, important and, from the manpower-educational planning viewpoint, the ISCO codification leaves much to be desired.

It should be mentioned in this context that the ILO has proposed a revised version of ISCO, which it is hoped will be ready and acceptable in time to be applied during the 1970 round of censuses. The various changes proposed are not likely to be very helpful for purposes of manpower-educational planning. On the contrary, it will be even more difficult to distinguish, for example, between skilled, semi-skilled and unskilled workers, or between professional workers and technicians (see also footnote * on the following page).

b) Problems posed by countries not using ISCO for the census

The ISCO was adopted by a large number of countries for the 1960 census. The countries which have not used the ISCO in their latest census can be divided into two categories: those which have a classification similar to ISCO, and those whose occupational classification is substantially different from it. In the former category, one could rank the United States and the Latin-American countries. The latter have for the most part adopted the COTA 1960.** This classification is quite close to the ISCO and the two can easily be translated into each other. There is one important difference, however: at the 2-digit level, the ISCO distinguishes "draughtsmen and technicians" (0X), a distinction which does not exist in the COTA 1960, where technicians are classified at the 3-digit level, together with engineers, chemists, agronomists,

* ISCO, op. cit., page 7.

** Programa del Censo de America de 1960, Panamerican Union, Washington.

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etc. This has, of course, the potential advantage that one can separate the various types of technicians. However, as for many countries the data are only available up to the 2-digit level, it follows that for many Latin-American countries, minor groups 0-0, 0-1 and 0-2 include scientists and technologists as well as middle-level technicians. *

In the second category are included such countries as France, Germany, Finland, Israel and the socialist countries, for which it has been more difficult to arrive at a comparable framework of reference.

ii) The industrial classification

Of the various types of classification (occupational, educational, industrial) discussed here, the industrial one poses least problem. This is so because such an international classification has been in use since 1948 and has been adopted by most countries. ** It should be mentioned that the ISIC classifies the data according to establishments, i.e., "an economic unit which engages, under a single ownership or control, in one, or predominantly one, kind of economic activity at a single physical location...". *** It is therefore not rigourously a classification by commodity. **** If one wanted to examine the occupational structure of a sector as derived from commodity demand, this would be possible only in so far as the product-sector relation is unequivocal. *****

The ISIC also serves as a basis for the United Nations National Accounts Statistics, and this has facilitated partly the collection of data concerning the indicators of economic and technological development which serve as explanatory variables in the analysis presented in Parts Two to Five of this study.

The fact that most countries have adopted the ISIC, does not by itself solve all problems. The question of the heterogeneity of sector composition becomes important in international comparisons. To give an example, it would not make much sense to compare the sector "mining and quarrying" in countries A and B if mining in A were concentrated on the production of crude petroleum, and in B on coal and

* In the revised version of ISCO, the same procedure is proposed, i.e., to distribute the technicians among the various professional sub-groups. In order to be useful to the manpower-educational planner, more detailed tabulations (at least up to the 3-digit level) will, therefore, be required.

** We refer, of course, to the ISIC - International Standard Industrial Classification of all Economic Activities, UNO, New York.

*** ISIC, op. cit., page 2.

**** For an example of such a classification, see the U.N. Standard International Trade Classification, SITC.

***** This, however, is the usual assumption in economic research. See, for example, H.B. Chenery, Patterns of Industrial Growth, AER, September, 1960.

metal-mining. This is, of course, partly an aggregation problem. In practice, at rather high levels of sector aggregation, this problem of heterogeneity is difficult to avoid. *

iii) Cross-classification of occupational categories by sectors of economic activity

As for the availability and coverage of data with regard to occupational categories cross-classified by economic sectors, we refer to the companion volume, Statistics of the Occupational and Educational Structure of the Labour Force in Fifty-Three Countries (OECD, 1969), which contains the tabulations on which the analyses presented here are based.

The various sources from which the data are drawn, as well as the definitions concerning the labour force, can be found in that publication under the relevant tables cross-classifying the occupational structure with sectors of economic activity.

We have not always used the maximum detail available for the various countries. The reasons for this will be given later in this Annex.

2. CLASSIFICATION PROBLEMS RELATED TO OCCUPATION-EDUCATION MATRICES

Let us deal now with two points: a) special problems raised by the occupational classification cross-classified by educational categories; b) further study of classification problems relating to levels and branches of education as distinguished in the educational structure of the labour force.

The sample size used for the occupation-education matrices is not necessarily the same as that used for the more traditional kind of census information. A certain number of difficulties and inconsistencies were, therefore, encountered in the definition and the size of the labour force when working with these matrices. For the sake of clarity, we have summarised the sources and definitions used in Table A. 1.

i) Problems of classification and aggregation in occupational categories

As these problems were discussed above, they only concern us here in so far as the breakdown of the occupational groups by level of education effectively imposes new constraints.

* We will come back to this point in the analysis of the results to be presented in Part Two.

First of all, it has to be pointed out that the bulk of the analysis of the educational profile of the occupational categories presented in this study was carried out at the level of the whole economy. Rare indeed are the countries which give three-way tabulations (occupation - education - economic sector) that would have made it possible to bring the analysis down to the sector level. There are, however, a few countries for which this information is available, and this is presented and analysed in Part Five.

Having said this, we shall now return to the occupation-education matrices available for the whole economy. A systematic study was made of five of the ISCO major groups, broken down by level of education: major groups 0 and 1, because they include the largest proportion of highly qualified personnel; major groups 2 and 3, because they tend to absorb more and more secondary and even university graduates, and major group 7/8, because of its quantitative and qualitative importance for industrial development. Major groups 4, and 5 to 7/8 were also analysed by taking the average number of years per head embodied in each of these groups. Given the very aggregated educational classification with which we have to work (see below, paragraph ii), this seemed the better educational indicator for these occupational groups.

Further, the available statistics make it possible to sub-divide the important major group 0 into a number of minor groups (see above). Unfortunately, many countries - about half - do not cross-classify these minor groups by levels of education. We had, therefore, to confine ourselves to studying the educational profile of:

- a category we shall label "scientific and technical personnel" (STP), composed of ISCO's minor groups 0-0, 0-1, 0-2 and 0-X;
- the technician's category consisting of the single minor group 0-X.

ii) Problems of comparing levels of education

Until recently, most studies aiming at international comparisons concerning the "quality" of the labour force have had to take as an indicator of the level of education approximations, such as enrolment rates, whether or not adjusted for the length of studies; the proportion of national income expended on education; the proportion of university students enrolled in the science and technology branches, etc.* It need hardly be said that the authors were perfectly aware of the limitations

* See, in particular, W. Galensen and G. Pyatt, The Quality of Labour and Economic Development in Certain Countries, ILO, Geneva, 1964; and Harbison and Myers, Education, Manpower and Economic Growth, McGraw Hill, 1963, which gives on page 27 a whole series of indicators of this type.

of these indicators, which were adopted in the absence of comparable data on the educational stock of the labour force. Thus, country A, with a large scale recent development of secondary education to its credit, may show a high enrolment rate for the corresponding age group; but if this improvement is very recent, the annual flows of certificate-holders will barely have had time to make an appreciable difference to the educational stock of the active population. Conversely, country B may have maintained the same average enrolment rate in secondary education for 20 years; this country's educational stock may then be higher than country A's, although its present enrolment rate may be lower. There is all the more chance of such situations arising as the annual flows of certificate-holders entering the labour force are small in relation to the total stock, which in fact takes 40 to 50 years to be completely renewed.

The advantage of working with stock indicators rather than flow indicators is quite obvious in this case, although the problems of comparison of the national classifications adopted for education may perhaps be harder to solve. A definite drawback of our data is that they only measure the stock of the formal by educated labour force, and hence do not take into account skills obtained by other means, such as on- and off-the-job training, experience in job operation, etc. Our data also give the same weight to a person educated forty years ago and one who finished his education one month before the census.

The various methods of classifying the educational stock of a population have been the subject of study by different international bodies*, but no common pattern has emerged as yet. It is therefore, necessary to discuss the different classifications used in the countries which are included in our analysis in order to understand more clearly the constraints under which the common classification had to be adopted.

a) Data by years of study within an educational cycle

One of the more interesting methods of presenting the educational attainment of the population consists in a breakdown by years of schooling completed within each cycle. Only four countries present their data in this way: Chile, Ecuador, Honduras and the Philippines. They are followed by a group of six countries where the method used is to supply data, not by individual years of schooling completed, but by batches covering two or three years' schooling, either indicating the cycle concerned (Canada, United States, Israel, Panama and Uruguay) or not (Korea). A direct comparison of these ten countries might necessitate

* See for example, Methods and Statistical Needs for Educational Planning, OECD, 1967, pages 144 et seq. As mentioned earlier, UNESCO is well advanced in preparing a standard educational classification - the equivalent of ISCO for educational stock data.

the elimination of Uruguay and the United States, as their data are not sufficiently detailed, as well as Israel, whose "cutting off points" by years are very different from those used by other countries.* For these countries, however, interpolations, inevitably rather rough, would be feasible.

There remains nevertheless a difficulty in converting "years of schooling completed" into "grades or forms completed". It is not always clear from the data which concept was used. Normally, the number of years of schooling would over-estimate the number of grades completed, because of "repeats".

The classification by number of grades completed is of great interest for any attempt at an accurate comparison of the educational stock of two populations. Frequently, however, the countries with this type of classification give little or no information on branches of education within the various levels; nor is the definition of a "completed cycle" always very clear.

b) Classification by certificates and degrees obtained

Census data concerning levels of educational attainment - France is a notable example - are based exclusively on certificates and degrees obtained. In these cases, the actual educational stock is considerably underestimated: a pupil who has never succeeded in passing the baccalauréat will be classified in the "primary school certificate" category (or even "without diploma").

In general, however, information on formal qualifications obtained is essential in order to supplement the data concerning years of schooling. This is particularly the case at the higher level, and in fact at all levels where education is not strictly organised by grades. There are indeed many reasons to believe that the "value" of one year of higher studies varies from country to country.

The problem could, of course, be approached in another way, by considering years of higher study as being of equal value in all countries; then the degrees themselves would not be comparable. Thus, a first university degree of the B.A. type in the United States, obtained after four years of college, is generally considered of less value than a first degree in the Netherlands, for example, which may require six to seven years of full-time study.

* Some countries possess unpublished data on the educational stock by years or groups of years of schooling, which might allow them to be included in this list. This is, for example, the case for Argentina: the data concerned are unpublished figures of the 20% sample of the 1960 census, used for Education, Human Resources and Development in Argentina, OECD, Paris, 1967. For France, see the study made by the Institut d'Etude du Développement Economique et Social: L'éducation de la population française et son évolution de 1850 à 1980,

In spite of these difficulties, the certificate or the degree remains the most usual criterion in studying the supply of and demand for qualified personnel. It constitutes practically the only "quality label" to facilitate the "trade" in graduates in the national and international labour markets.

c) Classification by level of studies

Some countries use the "level of studies reached" to estimate the educational attainment of the population. "Level of studies" is then synonymous with "cycle"; this is the case in Peru, Hong Kong and Norway.* The cycle may cover the whole corresponding level of education, or only half of it if the educational system divides each level into a lower and an upper cycle. In any event, it is always extremely difficult to separate those who have completed the cycle from those who have only reached it, as the necessary information on dropouts is usually not available. Generally speaking, we have refrained from this type of approximation, except for countries distinguishing very short cycles - a maximum of two years.

d) Types of courses and subjects studied

Ten countries state in varying detail the discipline in which university degrees were obtained. The breakdown adopted is the one recommended by UNESCO. For eight of these countries, the data by discipline can be directly obtained from the census returns**; for Argentina and Peru, the information can be drawn from the tabulations based on special samples of the census returns.*** Moreover, for the United States, the National Opinion Research Centre conducted an enquiry among 50,000 college graduates out of a total of 3,750,000 as given by the 1960 Census; a breakdown of these graduates into 15 disciplines is shown.**** Such data by branch of university education are, unfortunately, too scarce to lend themselves to exhaustive statistical treatment. They are therefore, excluded from the analysis presented in Parts Three and Four.

At the secondary level of education, around ten countries again (but not necessarily the same as those mentioned above) specify the

* For secondary education only in the case of Norway.

** Finland, Hungary, Israel, Netherlands, Norway, Portugal, Sweden and Yugoslavia.

*** 20 and 10% respectively. For Argentina, op. cit., Part III; for Peru, see Education, Human Resources and Development in Peru, OECD, 1968.

**** M.A. Schwartz, The United States College Educated Population, 1960, National Opinion Research Center, October, 1965, pages 72 et seq.

type of education taken: general, technical or commercial. For the reason given above, these sub-divisions have to be ignored in the statistical analysis, and "second-level" is used to cover all types of formal secondary education as given by the census data.

iii) Common classification adopted for educational data

The common educational classification adopted in the remainder of this study is concerned with 25 countries representing a wide range of stages of development, since it includes the United States and Sweden, as well as Pakistan and Korea. Ten of these countries are Members of the OECD. Geographically, America is the best represented continent (with nine countries, including seven in Latin America), followed by Europe and Asia (with seven countries each), and Africa with three. A complete list of the countries is given in Table A. 2 which also indicates in what form the educational data for these countries were available. From the foregoing comments on the heterogeneity of the educational classifications in use, it will be clear that the common classification finally adopted must be a compromise, and not a very detailed one at that. It had to be sufficiently wide to be applicable to a very heterogeneous group of countries, but at the same time sufficiently precise to have any meaning. In addition, we had to aim at the greatest possible number of observations by level in order to arrive at statistically meaningful results in the analysis.

The classification finally adopted contains the four following levels of education:

- university degree,
- complete secondary and beyond,
- more than eight years' schooling,
- eight years' schooling or less.

Two general points have to be underlined: first, the levels of education distinguished correspond as much as possible to actual stages in the educational system which are common to the 25 countries in the group. This is the reason why the above classification has taken as "cutting off" point eight years' schooling: many developed countries do not make a clear distinction for levels below that corresponding to compulsory education.

Secondly, the levels of education selected are cumulative rather than mutually exclusive. This was done in order to avoid certain ambiguities in the definitions of intermediate levels of education (see below).

Let us then briefly review each of the levels and give some indication of their relative importance as well as of the problems they raise.

a) University degree

A glance at Table A. 2 suggests that this level raises apparently the least problems for the countries under review, with a few notable exceptions, such as the United Kingdom* and Pakistan. We are here, of course, mainly concerned with the first university degree; only the United States and the UAR mention a "doctorate level"; these are included with first degrees.** Some estimates had to be made, however, for those countries which classified their educational data by years of schooling, without mentioning degrees. These are chiefly Latin-American countries (Chile, Ecuador, Honduras) or Asian countries (Korea and the Philippines). Because of the long effective duration of studies frequently observed in those countries, the last two years of the study mentioned were considered as equivalent to a degree: Chile (fifth and sixth years), Honduras and Ecuador (sixth and seventh years), the Philippines (fourth and fifth years), etc. The numbers, broken down by years of higher education, in fact suggest a massive outflow from the system before the last year mentioned which probably corresponds to the degrees obtained.

It was not found practicable to distinguish a separate "sub-university" level.*** There exists in about a dozen of our countries a form of post-secondary non-university education, stratified in years and leading up to final certificates which are distinct from university degrees proper. Enrolments in these types of education vary enormously from country to country; in some cases (Netherlands, Yugoslavia), a wide range of courses is offered, and the number of certificate holders may be of the same order of magnitude as that obtaining a university degree; in other countries, such education is principally confined to two types: teacher training, and training for certain social services (Sweden, Hungary, Argentina). In these instances, the numbers involved are much smaller.

Around ten countries give the number of persons in the population who have spent "some years at the university but without obtaining a degree"; obviously these are persons who left the university before completing their courses (United States, Canada, Korea, etc.).**** With one exception - Argentina - these countries are different from those supplying data on post-secondary non-university education and mentioned above. At first sight, then, it is tempting to lump together those holding post-secondary non-university certificates and those who

* The United Kingdom Census data give the educational attainment according to the age at which one left school.

** This level should properly be called "university degree and above".

*** Or post-secondary, non-university level; see Table A. 2.

**** And, in general, all countries who have adopted a classification by years of study.

have gone through a number of years of university education without obtaining a degree, on the assumption that they equal each other.

In actual fact, this type of approximation is beset with difficulties and may in many cases be misleading. Countries which have instituted post-secondary non-university education have done so with the primary object of broadening the educational possibilities of offering specialized courses which are different from the traditional university courses.

We did not, therefore, lump together "post-secondary non-university studies" and "some years at the university", unlike the Statistics of the Educational and Occupational Structure of the Labour Force in Fifty-Three Countries, where, for example, the Netherlands are shown to have 13.6% of the occupational major group 0 with B-level of education, compared with 17.5% in Canada, although in the latter country post-secondary non-university education is quasi non-existent. *

b) Complete secondary and beyond

In this category are included all those who have completed full secondary education. It, therefore, includes also university dropouts (see the arrows leading from column (f) to column (g) in Table A.2).

Several countries do not show the "complete secondary education" levels with precision. Korea mentions 10 to 12 years of schooling completed; Panama, four to six years' secondary education, etc. The situation is even less clear in Uruguay, where several types of education may be regarded as equivalent to full secondary. Some interpolations, therefore, has to be made.

Of the eleven OECD countries which provide data on levels of education, only seven are included at this level. The United Kingdom and France were eliminated for reasons already mentioned; Portugal was left out because the data do not allow the two types of secondary education of different duration, dispensed in that country, to be separated. Lastly, in Norway it was not possible to distinguish those who had completed secondary education from those who had not.

c) Over eight years' schooling

The study by Layard and Saigal, mentioned in the previous chapter, distinguishes between three levels of education below the "complete

* It will be recalled that B-level stands for "more than complete secondary education, but without university degrees". Certain ambiguities arise also in the case of other countries. In Japan, for example, sub-university education includes both the "higher schools" in the old system, which is a terminal education, and the present "junior colleges", which are stepping stones to higher levels.

secondary and over" level, namely ten years, eight years and five years of schooling, corresponding respectively to intermediate level (matriculation standard), middle level and primary level. Such a measurement of the educational stock (based upon the English educational structure) seemed to us neither feasible nor desirable.

Of the OECD countries, only three supplied unequivocal data below the incomplete secondary level: the United States, Canada and Yugoslavia.* Non-member countries have supplied fuller data for the lower levels, but these are hardly comparable: thus, full primary level may mean five to eight years' schooling, as the case may be, with only six countries specifying six years' schooling. This heterogeneity in the length of the primary cycle naturally affects the secondary level, whose duration in years of schooling depends on that of the primary cycle. Thus, the distinction between the three levels of education (ten, eight and five years) would add to the risks of error because of the unreliable interpolation it requires.

The above considerations led us to choose only one level of educational attainment below "complete secondary". This was fixed at "more than eight years' schooling", taking account of both the data available and the characteristics of the countries in our group, which includes 15 developing and 10 industrialised countries. The strategic interest of this category of "more than eight years' of schooling" as a comparative level of education is obvious for this kind of macro-economic study, for it is the level which is virtually accepted as the period of compulsory education in the developed countries, and a level at which a minimum of formal qualifications can be obtained in the developing countries.

In the statistical analysis which follows, the levels "more than eight years' schooling" and "eight years' schooling or less" will both be found, depending upon the occupational group under consideration or the kind of problem to be examined.

d) Average number of years of education

Lastly, it would be interesting to consider a synthetic measure summarising the total quantity of education embodied in a given population rather than a certain level of educational attainment. The average number of years of education per head seems to provide the most suitable indicator. Its calculation involves a whole series of interpolations and investigations of the past education stock of the labour force, the structural changes within each system, etc. We shall rely heavily on the figures calculated by Layard.**

* See Table A. 2, column m.

** Op. cit., Table 6, page 265.

3. PROBLEMS OF AGGREGATION

We have heavily touched upon many of these issues in the two preceding sections and particularly so in the last one. It will, therefore, be sufficient to summarize the arguments and to place them in a more general perspective.

In the hypothetical event of the information at our disposal being highly disaggregated, an ambitious attempt could have been made to determine an optimum level of aggregation in the light of the various objectives of the analysis. According to information theory, such an optimum level could be defined as the equilibrium level at which the gain in "information" by providing a more detailed distribution of the data is just offset by the loss of "information" as a result of uncertainty, statistical errors of measurement and classification, and, in the present case, lack of international comparability of occupational and educational categories.

However, our data are not highly disaggregated, although certain possibilities of using the information on the occupational structure in more or less aggregate form did subsist. But the margins of manœuvre are very small, i.e., the number of observations falls very rapidly as soon as more detailed breakdown are looked for. Since the bulk of the following analysis is carried out with the aid of regression analysis, the levels of aggregation had to be fairly high. It is precisely for these reasons that we decided to undertake in Part Five - using other statistical techniques - a few case studies for those countries which had substantially more detailed data available.

In Parts Two to Four, however, the following levels of aggregation for the various classifications used were practically imposed upon us by the data and statistical constraints.

i) The analysis of the occupational structure by economic sector: although in certain cases, occupational data were available up to the three-digit economic sector level, the minimum number of observations we had to adhere to did not allow us to go beyond the eight one-digit sectors of economic activity, except in the case of manufacturing, where the analysis could be pushed down to the two-digit sector level. The occupational distribution could be disaggregated for certain strategic two-digit professional occupations and also for the three-digit engineering category (see Part Two).

ii) This analysis of the educational profiles of occupational groups: in this case, it will suffice to refer to the preceding section of this chapter. The investigation was possible at the level of the whole economy only and for the educational categories mentioned in section 2 above (see Part Three and, for a more detailed analysis, Part Five).

iii) The analysis of the educational structure by economic sector: some educational categories as above; four one-digit economic sectors (see Part Four).

It may be of interest to return briefly to the four studies reviewed in Chapter II of the first volume and to refer specifically to the way problems of aggregation were handled. In all these studies, the analysis is at a higher level of aggregation than will be the case in the present investigation, with the partial exception of the Horowitz study. This author makes a strong case for the necessity of disaggregating as much as possible in terms of both economic sectors and occupational categories. In his statistical annex, he presents, for 17 countries, up to 225 occupational categories classified by up to 58 economic sectors. However, the regression analysis he carries out is done with only five very broad occupational categories, albeit for a certain number of two-digit economic sectors.

Table A.1. LABOUR FORCE STATISTICS CROSS-CLASSIFIED BY OCCUPATIONAL CATEGORIES AND LEVELS OF EDUCATION: REFERENCE YEAR, SOURCES AND DEFINITIONS

OECD COUNTRIES	YEAR	
CANADA	1961	1961 Census. Active population aged 15 and over.
UNITED STATES	1960	1960 Census. Civilian labour force.
FRANCE	1962	5% sample of the 1962 Census, Active population, apprentices excluded.
GREECE	1961	2% sample of the 1961 Census. Total active population.
JAPAN	1960	1960 Census. Employed labour force.
NORWAY	1960	1960 Census. Employed labour force.
NETHERLANDS	1960	1960 Census. Active population aged 14 and over.
PORTUGAL	1960	1960 Census. Employed Resident population.
SWEDEN	1960	1960 Census. Employed population.
YUGOSLAVIA	1961[1]	1961 Census and MRP estimation. Total employed population.
OTHER COUNTRIES	YEAR	
ARGENTINA	1960[2]	20% sample of the 1960 Census. Total active population.
CHILE	1960	1960 Census. Active population aged 12 and over.
KOREA	1960	20% sample of the 1960 Census. Employed civilian labour force aged 13 and over.
ECUADOR	1962	3% sample of the 1962 Census. Active population aged 12 and over.

GHANA	1960	1960 Census and "Survey of High Level Manpower in Ghana, 1960". Employed active population.
HONDURAS	1961	1961 Census. Active population aged 10 years and over.
HONG KONG	1961	1961 Census. Working population aged 15 and over.
HUNGARY	1960	Hungarian Planning Commission. Employed civilian labour force.
ISRAEL	1961	20% sample of the 1961 Census. Employed civilian labour force.
PANAMA	1960	1960 Census. Occupied persons aged 10 and over. The Indian tribal population is excluded.
PAKISTAN	1961	1961 Census. Civilian population aged 10 years and over employed in non-agricultural activities.
PERU	1961	10% sample of the 1961 Census. Employed labour force.
PHILIPPINES	1961	10% sample of the "Statistical Survey of Households". Employed persons aged 10 and over.
POLAND	1964	Data provided by the "Central School of Planning and Statistics", Warsaw, Civilian employed population.
PUERTO RICO	1965	Special tabulations of the Puerto Rico Planning Board, 1965. Active population.
EGYPT (UAR)	1960	1960 Census. Active population aged 15 (or 10) and over.
SYRIA	1960	Data provided by Ministry of Planning, Damascus. Active Syrian Arab population.
URUGUAY	1963	5% sample of the 1963 Census. Active population aged 10 and over.
ZAMBIA	1965[3]	Employed civilian labour force, excluding workers in semi-subsistance and subsistance sectors.

1. See the MRP Country Report on Yugoslavia, OECD, Paris 1965, and DAS/MRP/66.2 "The Development of Education in Yugoslavia in the Period 1966-70 and its Adaptation to the Needs of the Economy and Society".
2. See "Education, Human Resources and Development in Argentina", OECD, Paris, 1967.
3. See "Manpower Report, a Report and Statistical Handbook on Manpower, Education, Training and Zambianisation 1965-66", Government Printer, Lusaka, 1966.

SOURCES: Statistics of the Occupational and Educational Structure of the Labour Force in 53 Countries, OECD, Paris 1969.

Table A 2. CENSUS STATISTICS - EXISTING DATA BY LEVELS AND TYPES OF FORMAL EDUCATION

COUNTRIES	YEAR	BEYOND THE UNIVERSITY FIRST DEGREE	UNIVERSITY DEGREE LEVEL	FIELD OF STUDY	POST-SECONDARY LEVEL	SOME YEARS IN UNIVERSITY	COMPLETE SECONDARY SCHOOLING	TYPES OF SECONDARY SCHOOLING	INCOMPLETE SECONDARY SCHOOLING	COMPLETE PRIMARY SCHOOLING	INCOMPLETE PRIMARY SCHOOLING	ILLITERATES OR WITHOUT SCHOOLING
	a	b	c	d	e	f	g	h	i	m	n	o
OECD Members												
Canada	1961 (1)		X			X	X 4-5 years		X (2)	X (2)	X	
United States	1960 (3)	X	X 4 years of college	X (3)		X	X		X (3)	X (3)	X (3)	
France	1963		X	Certification by Degrees Obtained								
Greece	1961		X				X			X	X	
Japan	1960 (4)		X		X		X				X	
Norway	1960		X	X	X		X (5)	TC				
Netherlands	1960		X	X	X		X	GT			X	
Portugal	1960		X	X	X		X (6)	GT			X	X
United Kingdom	1961 (7)		Classification according the terminal education age									
Sweden	1960		X	X	X		X	GTC			X	
Yougoslavia (8)	1961		X	X	X		X	GTC		X 8 years or less		
Other Countries												
Argentina (9)	1960		X	X	X	X	X	GTC	X	X	X	
Chile	1960		From 1 to 6 years in University			X	X	GTCA	X	From 1 to 6 years of Primary Schooling	X	X
Korea	1960		Classification by years of schooling, from 0 to 17 years or more, by groups of 3 years									
Ecuador	1962		From 1 to 7 years in University			X	From 1 to 6 years of Secondary Schooling		X	From 1 to 6 years of Primary Schooling	X	X
Finland (10)	1960		X	X								
Ghana	1960		X		X		X	GTC	X "Middle" level (11)	Primary level		X
Honduras	1961		From 1 to 7 years in University			X	From 1 to 5 years of Secondary Schooling		X	From 1 to 6 years of Primary Schooling	X	X
Hong-Kong	1961		Classification by levels of schooling									X
Hungary	1960		X	X	X		X			X (12)		
Israel	1961		X	X	X	X	11 years of schooling or more	GT	X	X 6 years	X	
Panama	1960		X 4 years or more in University			X	4-6 years of Secondary Schooling		X	4-6 years of Primary Schooling	X	X
Pakistan	1961		X	Classification by levels of schooling								X
Peru	1961		Classification by levels of schooling									X
Philippines	1961		From 1 to 5 years in University			X	From 1 to 4 years of Secondary Schooling		X	From 1 to 7 years of Primary Schooling	X	X
Poland (13)	1944		X				X	GTCA	X	X	X	X
Puerto Rico	1965		Classification by years of schooling, from 0 to 13 or more, by groups of 3 years (14)									
United Arab Repub.	1960 (15)	X	A				X		X			X
Syria	1960		X	Classification by Degrees Obtained								X
Uruguay	1963		X 4 years or more in University		X		X	GT	X	X 6 years	X	X
Zambia	1966		X	Classification by Degrees Obtained								

i) Sources of Table A. 2

The figures in this table are drawn from Statistics .. op. cit., OECD, Paris, 1969. In certain cases, as indicated in the notes, they have been supplemented from other easily accessible sources.

The 31 countries with roughly comparable educational statistics are shown here; for the statistical analysis, we used only the 28 countries which could be included in a common classification without excessively unreliable approximation or interpolations. The United Kingdom, Finland and Peru were excluded.

Other countries (Jamaica, Czechoslovakia, Thailand, USSR) supplied interesting data about the educational stock of their labour force, but these were too incomplete or remote from the common classification adopted.

ii) Key

An "X" at the intersection of a line and a column means that the statistical figure exists and is directly usable; in this case, "X" is shown on the left-hand side of the column.

"X" is sometimes replaced or accompanied by an explanation in full; in this case, the figure exists, but is only usable after interpretation.

"X" is sometimes shown in the middle of the column (column g). This means that the figures for this level of education only exist in combination with those for the level immediately above; the latter are presented by arrows leading from column f to column g.

"G", "T", "C" and "A" stand for General, Technical, Commercial and Agricultural.

"X" in the middle of a horizontal line joining several columns means that the figures are not available in the detail required by the column headings.

Notes

(1) Figures also exist for the previous decade, in the 1951 census returns, with some slight differences in the method of classification.

(2) The figures cannot be used without some approximation, owing to the co-existence in the country of several systems of education.

(3) For the 1950 figures, see Statistics .. op. cit., OECD, Paris, 1969.

Columns d: see The United States College Educated Population: 1960 by M.A. Schwartz, National Opinion Research Center, October, 1965, page 73 et seq.

Columns l, m, n: figures drawn directly from the American Census; not appearing in the OECD volume.

(4) Data exist by years of schooling for 1950, but their comparison with the figures for 1960 raises certain problems. See the results obtained by R. Trajtenberg, in an appendix to the Technical Evaluation of the First Stage of the Mediterranean Regional Project, OECD, Paris, 1966, pages 137 et seq.

(5) Those who completed general secondary education are not separated from those who merely began it.

(6) It was not possible to distinguish between those holding a general secondary school certificate after nine years' schooling and those who obtained it after eleven years' schooling; the first group has, in fact, only "incomplete secondary" education, according to our comparative criteria.

(7) Similar figures are also to be found in the 1951 Census returns.

(8) The data supplied by the OECD volume were completed from the "Yugoslavia" Report, Mediterranean Regional Project, OECD, Paris, 1965, and the document DAS/MRP/66.2, The Development of Education in Yugoslavia in the Period 1966-1970 and its Adaptation to the Needs of the Economy and Society.

(9) The figures are drawn from a census sample (20%); most of them are published in Education, Human Resources and Development in Argentina, OECD, Paris, 1967. Some other unpublished tables in more detail give a breakdown of the active population into 98 occupational groups and 56 levels of education.

(10) Note the inconsistencies between Tables II.A.1 and III.1 in Statistics .. op. cit., OECD, Paris, 1969.

(11) From six to ten years' schooling.

(12) With and without vocational training.

(13) The figures by levels of education are broken down by economic sectors, not by occupational categories.

(14) The classification by groups according to years of schooling is only directly usable at "full secondary" level.

(15) The classification is made according to certificates obtained; it allows, however, for a rather good appreciation of the educational structure of the labour force.

Annex B

LEVELS OF EDUCATION OF THE DIFFERENT OCCUPATIONAL CATEGORIES AND TECHNOLOGICAL INDICATORS: MULTIPLE AND STEP-WISE REGRESSION EQUATIONS

The analyses included in this Annex should be considered as a follow-up of those presented in Chapters IX and X of the first volume. In these Chapters, we tried to "explain" the educational level of occupational categories by using technological indicators tested one by one successively. The purpose of this Annex is to determine whether the fraction of the variance of educational levels of occupations "explained" by one technological indicator, increases when a second one is introduced into the equation.

1. MULTIPLE REGRESSION EQUATIONS

It will be remembered that we were guided in our choice of explanatory variables for the simple regression equations by the desire to allot to the "capital" variable ($\Sigma I/L$) a role similar to that played by X/L. Thus, just as a certain level of labour productivity required a certain level of education in the work force, the capital invested per person employed required manpower with the necessary qualifications for its utilisation.

The quality of the correlations obtained varied according to the categories and educational levels, with perhaps a slight advantage in favour of labour productivity. However, the simple fact that X/L and $\Sigma I/L$ were tested separately clearly shows that these two variables were regarded as more or less interchangeable.

Our present aim is quite different, i.e., to ascertain whether the variance of the dependent variables which is not explained by productivity can be wholly or partly explained by introducing the "capital

intensiveness" variable (Σ I/L) into the equation. This working hypothesis thus rests on the complementarity of the explanatory variables.

It can indeed be argued that different educational structures may correspond to a given level of productivity, according to whether production techniques in one country utilise more capital than in another. More specifically, let us assume that two countries, A and B, have roughly the same level of productivity, and that x and y per cent of their respective labour force are university graduates. Let us assume that B has invested more than A, and therefore probably employs more sophisticated production techniques; will their application demand a different proportion of graduates ($y\% = x\%$)? If so, will B need more graduates than A ($y\% > x\%$), or instead, will its production techniques enable it to "economise" highly qualified graduates ($y\% < x\%$)?

To try to find answers to these questions, we shall use two multiple regression equations in the following form:

$$\log (Ljk/L) = \log a + b \log (X/L) + c \log (\Sigma I/L)$$

$$\log (kj) = \log a + b \log (X/L) + c \log (\Sigma I/L)$$

The full results are given in Tables B. 1 and B. 2. It can be seen from a glance at those tables that:

a) very few of the correlations are appreciably improved by introducing (Σ I/L)*,

b) the immense majority of regression coefficients are not significant.

The fact that the fraction of the explained variance of the dependent variable does not increase with the introduction of "capital" per person employed, thus seems to show that X/L and Σ I/L (each more or less closely correlated with the educational and/or occupational structure according to the levels and/or categories considered) are not complementary, as might have been thought.

This is due to the high correlation between X/L and Σ I/L; R = 0.94 with 22 observations. A close collinearity between the two explanatory variables of a multiple regression equation in fact results in some indetermination of the plane of correlation for the equation: the observations for the three variables are correlated along a straight line in three-dimensional space. There will thus be an infinite number of possible planes passing throught that straight line.

* Compares with Tables III-1, III-2 and III-3 in the first volume.

Table B.1. MULTIPLE REGRESSION EQUATIONS

LINKING { THE EDUCATIONAL LEVEL OF OCCUPATIONAL CATEGORIES, (Ljk/L, Ljk/Lj)
THE OCCUPATIONAL STRUCTURE (Lj/L)
THE EDUCATIONAL STRUCTURE (Lk/L)

TO { LABOUR PRODUCTIVITY (X/L)
GROSS CAPITAL FORMATION PER WORKER (Σ I/L)

$$\left.\begin{matrix}\log\ (Lj/L)\\ \log\ (Ljk/L)\\ \log\ (Lk/L)\\ \log\ (Ljk/Lj)\end{matrix}\right\} = \log a + b \log (X/L) + \log (\Sigma I/L)$$

OCCUPATIONAL STRUCTURE		DEGREE LEVEL AND ABOVE (A)				COMPLETED SECONDARY SCHOOLING AND ABOVE (B)				MORE THAN EIGHT YEARS OF SCHOOLING (C)				EIGHT YEARS OF SCHOOLING OR LESS (D)				OCCUPATIONAL STRUCTURE Lj/L			
		R	log a	b(σ b)	c(σ c)	R	log a	b(σ b)	c(σ c)	R	log a	b(σ b)	c(σ c)	R	log a	b(σ b)	c(σ c)	R	log a	b(σ b)	c(σ c)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Major Group 0	Ljk/L	0.72	0.72	1.12(0.56)	-0.24(0.44)	0.82	-1.51	0.30(0.38)	0.35(0.30)	0.87	-1.06	0.10(0.35)	0.43(0.28)	0.18	-0.04	-0.46(1.01)	0.44(0.82)	0.80	-1.11	0.40(0.21)	0.19(0.17)
	Ljk/Lj	0.37	0.35	0.73(0.49)	-0.43(0.39)	0.41	1.39	0.04(0.24)	0.09(0.19)	0.41	1.66	0.03(0.18)	0.04(0.15)	0.45	2.69	-0.54(0.94)	0.06(0.76)				
Minor Groups 00/01/02/0X	Ljk/L	0.79	-3.40	1.09(0.71)	-0.19(0.61)	0.88	-3.31	1.44(0.64)	-0.44(0.56)									0.79	-2.84	1.07(0.71)	-0.16(0.62)
	Ljk/Lj	0.02	1.44	0.03(0.78)	-0.03(0.67)	0.52	0.90	0.64(0.54)	-0.36(0.48)												
Minor Group 0X	Ljk/L	0.68	-5.34	2.73(1.37)	-1.62(1.15)	0.58	-2.70	0.61(1.51)	0.09(1.30)									0.54	-1.81	0.32(1.04)	0.20(0.86)
	Ljk/Lj	0.24	-1.54	2.42(1.43)	-1.52(1.20)	0.54	0.72	0.38(0.72)	-0.07(0.62)												
Major Group 1	Ljk/L	0.69	-3.38	0.35(0.66)	0.47(0.53)	0.80	-2.96	0.57(0.53)	0.32(0.43)	0.82	-3.22	1.26(0.70)	-0.25(0.57)	0.46	-2.23	1.43(1.15)	-0.78(0.93)	0.71	-2.09	0.95(0.47)	-0.22(0.38)
	Ljk/Lj	0.45	0.71	-0.60(0.49)	0.69(0.39)	0.49	1.32	-0.45(0.37)	0.53(0.30)	0.68	1.22	-0.06(0.25)	0.23(0.20)	0.45	2.21	0.09(0.59)	-0.31(0.48)				
Major Group 2	Ljk/L	0.36	-3.07	1.47(1.09)	-0.82(0.87)	0.61	-2.06	0.90(0.69)	-0.17(0.56)	0.92	-2.17	1.18(0.35)	-0.33(0.28)	0.40	-0.41	-0.43(0.90)	0.62(0.73)	0.78	-1.20	0.51(0.35)	0.11(0.28)
	Ljk/Lj	0.30	0.13	0.97(0.91)	-0.94(0.73)	0.20	1.15	0.47(0.58)	-0.36(0.47)	0.65	1.10	0.59(0.25)	-0.37(0.20)	0.63	2.87	-1.02(0.52)	0.58(0.42)				
Major Group 3	Ljk/L	0.47	-3.88	0.86(0.98)	-0.07(0.79)	0.61	-2.54	0.36(0.80)	0.38(0.64)	0.83	-2.71	1.52(0.58)	-0.62(0.47)	0.05	0.12	0.72(1.15)	-0.61(0.93)	0.25	0.25	0.01(0.56)	0.16(0.45)
	Ljk/Lj	0.39	-2.13	0.85(0.95)	-0.23(0.76)	0.48	-0.69	0.27(0.62)	0.27(0.66)	0.68	-1.23	0.55(0.54)	-0.05(0.44)	0.58	2.70	-0.25(0.44)	-0.05(0.35)				
Major Groups 7/8	Ljk/L					0.67	-3.37	0.64(0.91)	0.36(0.73)	0.71	-2.32	0.56(0.97)	0.33(0.78)	0.23	0.05	0.49(1.26)	-0.17(1.02)	0.46	0.04	0.31(0.61)	0.09(0.49)
	Ljk/Lj					0.45	-1.41	0.34(1.01)	0.29(0.81)	0.49	-2.23	0.12(0.98)	0.34(0.79)	0.31	2.15	0.05(0.44)	-0.16(0.36)				
Educational Structure	Lk/L	0.64	-2.28	1.03(0.61)	-0.74(0.49)	0.74	-1.31	0.44(0.53)	0.28(0.43)	0.81	-1.12	0.81(0.54)	-0.07(0.43)	0.86	2.77	-0.25(0.18)	-0.04(0.14)				

The method of calculating Σ I/L si certainly at least partly responsible for this high correlation with X/L. There is, of course, nothing new about these statistical links between investment and productivity, but they are here strengthened owing to the fact that Σ I/L is calculated for the eight years preceding the census, whereas X/L indicates the level of productivity in the census year.

More specifically, this means that any variation in Σ I/L results in corresponding variations in X/L, owing to the high correlation between the two variables; or again, that if two countries, A and B, have the same level of productivity, their levels of investment will also be similar, in which case the differences observed in the educational structure cannot be "explained" as suggested above.

Time series, and a more "refined" assessment of Σ I/L, may, however, well lead to different conclusions [Layard and Saigal introduce the discussion in terms of a classical production function. Our variable Σ I/L, shown as the X-axis in the graph illustrating their study (page 228) instead of the capital-labour ratio K/L, would have the effect of merging the two curves T2 and T1 together, owing to the very high correlation with X/L. The only changes in educational structure to be considered would then be changes along a single production function, the same year being taken for all countries]. Such a cross-section analysis as that made by us, taking account of the sometimes rough approximations which affect our variables, thus allows the changes in the production function to be ignored; the analysis thus contributes to the building of a rather artificial universe where the ownership of trade secrets or industrial patents carries no special advantage, the international flow of technical knowledge is unrestricted, its embodiment proceeds at roughly the same rate in all countries, etc. These assumptions are in fact frequently* adopted.

Lastly, as regards the imprecision of the regression coefficients, it is known that important standard deviations are a direct consequence of collinearity between explanatory variables. It will thus not be possible to separate the influence of X/L and Σ I/L, still less to estimate their effects on the dependent variable.

As an example, one of the least unsatisfactory equations in Table B.1 is given below:

$$\log (Ljk/Lj) = 1.10 + \underset{(0.25)}{0.59} \log (X/L) - \underset{(0.20)}{0.37} \log (\Sigma I/L) \qquad R = 0.65$$

* For a typical and very familiar example, see, "Patterns of Industrial Growth", by Hollis B. Chenery, American Economic Review, September 1960.

Table B.2. MULTIPLE REGRESSION EQUATIONS

LINKING { THE MEAN YEARS OF SCHOOLING OF OCCUPATIONAL CATEGORIES, kj
THE MEAN YEARS OF SCHOOLING OF TOTAL LABOUR FORCE, kt

TO { LABOUR PRODUCTIVITY (X/L)
GROSS CAPITAL FORMATION PER WORKER (Σ I/L)

$$\begin{matrix}\log kj \\ \log kt\end{matrix} = \log a + b \log (X/L) + c \log (\Sigma I/L)$$

OCCUPATIONAL CATEGORIES	MEAN YEARS OF SCHOOLING (E)			
	R	log a	b(σ b)	c(σ c)
Major Group 0	0.43	0.84	0.07 (0.13)	0.00 (0.10)
Major Group 1	0.65	0.45	0.08 (0.18)	0.09 (0.14)
Major Group 2	0.42	0.65	0.27 (0.18)	-0.16 (0.14)
Major Group 3	0.62	-0.92	0.83 (0.52)	-0.30 (0.41)
Major Group 4	0.67	-1.72	0.70 (0.68)	0.02 (0.54)
Major Group 5	0.64	-0.74	0.60 (0.45)	-0.13 (0.35)
Total Active Population	0.72	-1.03	0.65 (0.44)	-0.09 (0.35)

where j represents major group 2 and k "more than eight years' schooling". The correlation is slightly better by comparison with the simple regression equations; R = 0.45 was obtained for X/L, and R = 0.31 for Σ I/L. If it is further admitted that the coefficient of elasticity for Σ I/L is significantly different from 0, for the time being leaving the standard deviation out of account, this negative coefficient would mean that, as Σ I/L increases Ljk/Lj diminishes, and vice versa, X/L being kept constant. Stated another way, some substitution would be possible as between physical and intellectual investment.

This being granted, our standard deviations preclude any such conclusions. If any further proof were needed of the imprecision of these results, it could be found in the fact that the regression coefficients for Σ I/L in Tables B.1 and B.2 are sometimes positive and sometimes negative, for no known reason.

2. STEP-WISE REGRESSION EQUATIONS

The conclusions in the previous paragraph will be further strengthened by the use of the step-wise system with the three economic indicators: productivity (X/L), investment (Σ I/L) and the non-monetary indicator (Ie). It may be pointed out that the originality of this type of equation lies in that the explanatory variable showing the best correlation with the dependent variable is selected first, and that a second variable and, if need be, a third, is introduced only insofar as they help to improve the correlation. This procedure reduces to some extent the arbitrariness of any enforced choice of explanatory variables, and enables the variables giving the best correlation to be selected directly.

Let it be said at once that the results obtained with the step-wise equation will do nothing to alter our opinion with regard to the limitations of "explanation" supplied by economic variables. Thus here again, any improvement (usually very slight) in the correlation coefficients is counterbalanced by such large standard deviations as to rob the regression coefficients of any significance.

As examples, the following results were obtained, with j representing major group 0 and k "university-degree level or above":

$$\log (Ljk/L) = -1.83 + 1.23 \log (Ie) \qquad R = 0.79^*$$
$$(0.21) \qquad N = 22$$

* The slight differences compared with results in Tables III-1 and III-2 are due to the number of observations.

$$\log (Ljk/L) = -1.33 + 2.14 \log (Ie) - 0.60 \log (\Sigma I/L) \qquad R = 0.83$$
$$(0.53) \qquad (0.32) \qquad N = 22$$

or alternatively:

$$\log (Ljk/Lj) = 0.68 + 0.42 \log (Ie) \qquad R = 0.41^{*}$$
$$(0.21) \qquad N = 22$$

$$\log (Ljk/Lj) = 1.34 + 1.62 \log (Ie) - 0.79 \log (\Sigma I/L) \qquad R = 0.63$$
$$(0.48) \qquad (0.29) \qquad N = 22$$

$$\log (Ljk/Lj) = 1.24 + 1.56 \log (Ie) - 0.84 \log (\Sigma I/L) + 1.08 \log (X/L) \qquad R = 0.63$$
$$(0.56) \qquad (0.37) \qquad (0.48) \qquad N = 22$$

This goes to show that a plane can be determined with the Ie, productivity and capital-intensiveness variables despite their high collinearity: R = 0.92 between Ie and $\Sigma I/L$, R = 0.93 between X/L and Ie. This may, however, be due to the low simple correlation obtained between Ljk/Lj and Ie.

In any case, these examples are too isolated for any general conclusions to be drawn. It will, however, be noted that the elasticity for capital intensiveness is sometimes significant and negative; it partly offsets the distinctly higher elasticity for Ie as soon as $\Sigma I/L$ is introduced. Thus, if log (Ie) rises by 1%, log (Ljk/Lj) rises by 0.40% in the simple regression; if, furthermore, log (Ie) and log ($\Sigma I/L$) each rise by 1%, log (Ljk/Lj) rises by 1.62-0.79 = 0.83% - more than double. This shows, in particular, that the difficulties of interpretation are practically insuperable if no allowance is made for the standard deviations of the coefficients.

* The slight differences compared with results in Tables III-1 and III-2 are due to the number of observations.

Annex C

ANALYSIS OF THE OCCUPATIONAL AND EDUCATIONAL COEFFICIENTS

The analyses presented in Parts Two, Three and Four of Volume One have focused exclusively on the percentage distribution of occupational categories and educational levels in the labour force, and on the factors likely to have an influence on this distribution.

It is also possible to analyse occupational or educational coefficients. These coefficients are defined as the number of persons in a given category required to produce a unit of output, here one million of US dollars. They can be considered as the inverse of partial labour productivity.

They may have certain advantages over occupational or educational categories expressed as a percentage of the total or sectoral labour force. First, these percentages are sometimes very small: proportion of highly qualified manpower, proportion with a University Degree in the total labour force, etc. They may, therefore, be very sensitive to changes in quantitatively more important categories: a relatively small change in the latter may have an important impact on the former. On the contrary, the occupational coefficients are mathematically independant from one another. Second the coefficients have the advantage of linking the number of persons in a given occupation directly to output, which is variable more readily available than most others.

In this Annex, we will present a few analyses referring to the following coefficients:

Lj/X : number of persons in an occupational category j per one million dollars worth of output (occupational coefficients);

Lk/X : number of persons with a level of education k per one million dollars worth of output (educational coefficients);

Ljk/X : number of persons in an occupational category j with a level of education k per one million dollars worth of output (occupational-educational coefficients);

Lik/Xi: number of persons working in a sector i with a level of education k per one million dollars worth of sectoral output (sectoral-educational coefficients).

We will show in Section 2 of this Annex that the parameters of the equations having a percentage as a dependant variable, are linked to the parameters of the equations having a coefficient as a dependant variable by a simple mathematical relationship, whenever labour productivity is taken as the independant variable.

That is why it is not necessary to repeat here the bulk of regression analyses presented in the First Volume.

1. ANALYSES OF OCCUPATIONAL COEFFICIENTS

As stated above, there is a fixed relationship between the parameters of the equation:

$$\log (Lj/L) = \log a + b \log (X/L) \qquad (1)$$

and those of the equation:

$$\log (Lj/X) = \log a + b \log (X/L) \qquad (2)$$

It is intuitively clear that, whenever the elasticity between Lj/L and X/L is equal to one in equation (1), Lj/X is constant. In the same way, whenever the elasticity between Lj/L and X/L is superior (or inferior) to one, this means that Lj/X will show an upward (downward) tendancy as X/L increases.

The analysis of the occupational structure presented in Part Two of the First Volume has shown that, in all sectors except perhaps in Manufacturing, the majority of elasticity coefficients with respect to X/L were less than one. The consequent fall in the partial labour/output ratios can be compared to the fall in the capital/output ratio observed in many countries as the economy develops. *

* See, for example, S.J. Patel "Incremental Capital Output Ratios", Kyklos, Vol. XXI, 1968.

Having said this, graphic analysis is still interesting to show that there is a wide dispersion among occupational coefficients around the mean value, although, for some groups of countries, these are fairly stable within a given range of productivity.

Let us examine, for example, some of the equations $Lj/L = f(X/L)$ with a regression coefficient equal to one: see Table II-1 in the First Volume. This is the case for STP category (0.98) and for the minor group 0-0: engineers, etc. (1.06). Their corresponding occupational coefficients would, therefore, have a tendency to remain constant. That this is indeed the case can be verified in Graph C.1, where the coefficients for 0-0 are related to output per worker. It also becomes clear, however, that variations around the average are quite considerable, as could already be deduced from the size of the standard deviation of the regression coefficient: 1.06 (0.13).* For the same reason an even greater variation around the average can be expected for the STP category.

In manufacturing, it will be recalled, the regression coefficient of m.g. 0 was exactly unity when related to sector labour productivity (see Table II-2). Graph C.2 - which shows the corresponding occupational coefficient related to sector labour productivity - again illustrate the substantial differences around the average: the coefficient in question varies mainly between 7 and 20 per million dollars of sector output, irrespective of the level of productivity.

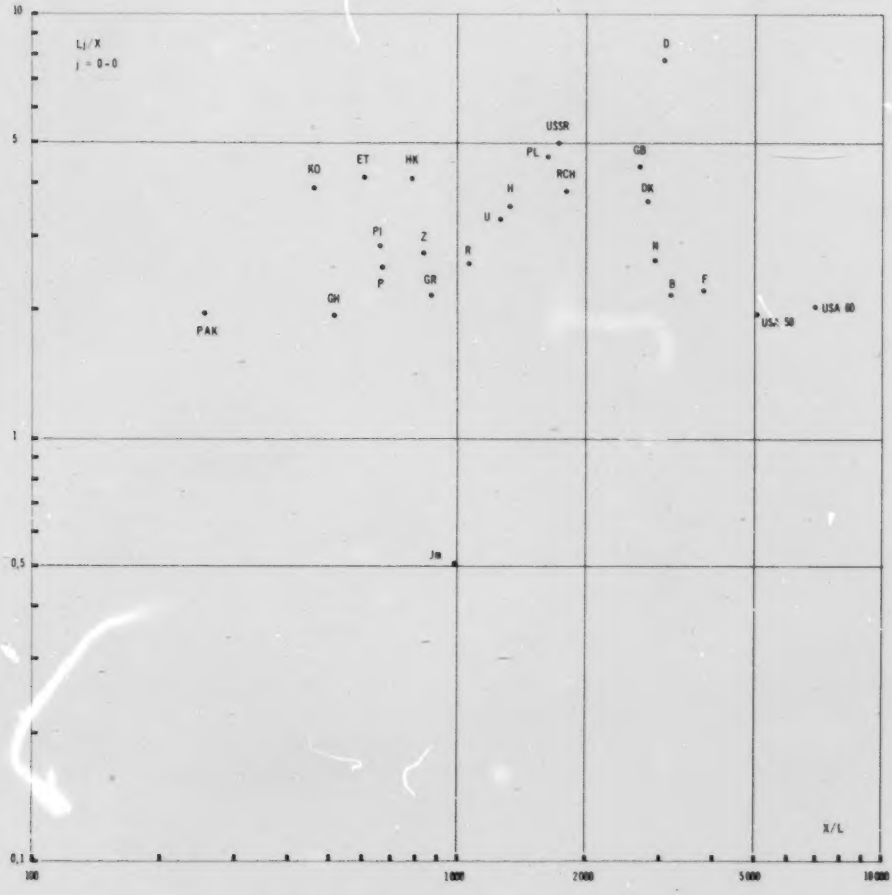
The number of illustrations could be greatly extended, but this would not lead to a clearer insight than that obtained in Part Two.

Of course, it is always possible to isolate on the graphs a few groups of countries for which there is a tendency towards constancy of the occupational coefficients. However, our conclusion is that, although this tendency does exist in certain cases, the limits within which the coefficients can vary are considerable. With the data available for the present study, it is not possible to push the investigation any further. Quite clearly, it would be of the greatest interest to extend the analysis on a case study basis by taking the countries with different values of their occupational coefficients at the same level of development or, vice versa, to deepen it - by bringing a host of additional explanatory variables into the analysis - in order to determine which are the most important factors behind those variations.

* See Table II-1.

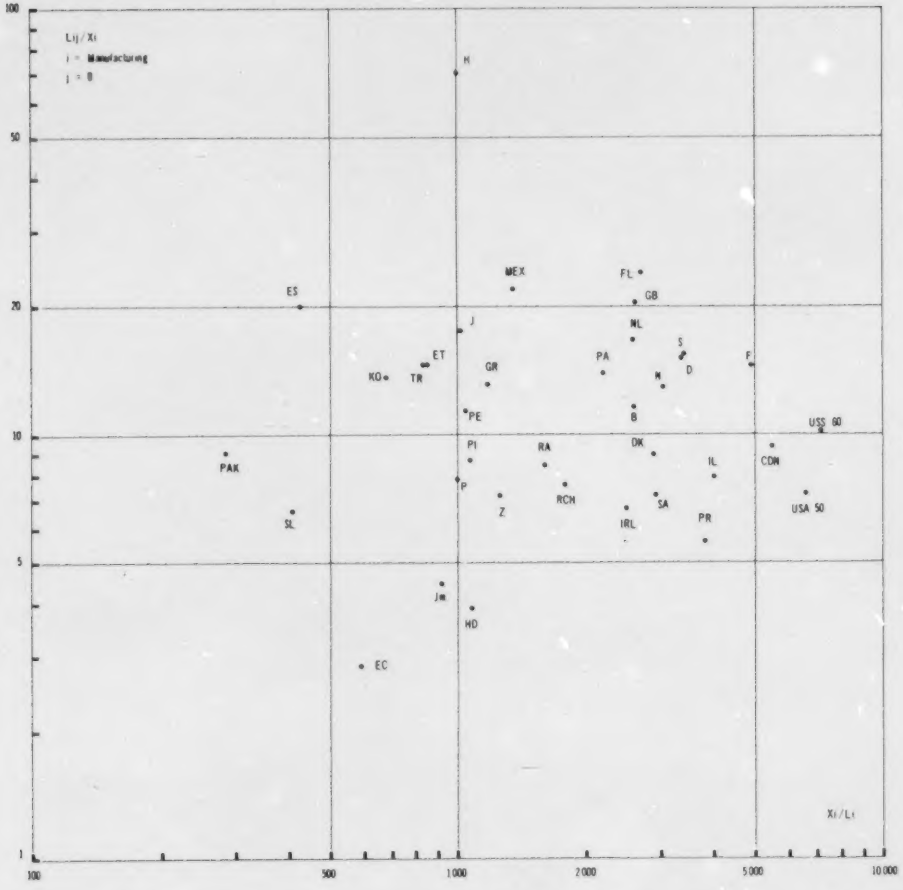
Graph C-1

WHOLE ECONOMY : ARCHITECTS, ENGINEERS AND SURVEYORS PER UNIT OF OUTPUT (L_j/X) AND OUTPUT PER WORKER (X/L)



Graph C-2

MANUFACTURING : PROFESSIONAL AND TECHNICAL WORKERS PER UNIT OF SECTOR OUTPUT (L_{ij}/X_i) AND SECTOR OUTPUT PER WORKERS (X_i/L_i)



2. ANALYSES OF OCCUPATIONAL-EDUCATIONAL COEFFICIENTS

Our aim here, then, will be to try and discover any econometric links between these coefficients and levels of economic development. The value of the operation is two-fold:

a) To anyone interested in a detailed study of the factors of production, it may be useful to know what occupational structure and/or educational inputs correspond to one unit of output at a given level of development. Are the structure or inputs unique - and complementary - or are certain substitutions possible, and if so, under what conditions?

b) If the aim of the analysis is to forecast requirements by occupational categories and/or levels of education, the data sought (Lj, Lk or Ljk) can then be deduced directly from the product X rather than from employment L.

Use of the coefficients thus offers a method of by-passing employment forecasting, itself the resultant of output and productivity forecasting; the advantages are appreciable, considering the uncertainties inherent in the latter. It goes without saying that the use of the "direct approach" linking occupation and/or education with gross product by a simple ratio can then obviate any reference to labour productivity, notably its adoption as an explanatory variable.

It would be possible with these coefficients to repeat the different types of analyses dealt with in Part Three, namely:

- analysis of the links between the coefficients and economic variables (Chapters IX and X);
- influence of the "supply" from the educational system on the coefficients (Chapter XII);
- reaction of the coefficients to the combined influence of the economic indicators and the supply of graduates, the last two factors showing a fair degree of interdependence (Chapter XIII).

In actual fact, apart from the procedure being somewhat wearisome for the reader, the results obtained hardly justify such a procedure. With the exception of a few groups of countries whose behaviour is "consistent", the evidence in most cases shows, the coefficients to be ruled by complex sets of factors which cannot be grasped through any macroeconomic study.

We shall, therefore begin by studying the links between the different types of coefficients; we shall then consider some of the coefficients in

conjunction with some development indicators. We shall end by testing graphically certain coefficients for labour productivity, with the sole object of finding out whether any groups of countries showing the same behaviour can be identified.

i) Analysis of the Relationships Between Coefficients

This analysis has a dual aim:

a) to confirm certain relationships arrived at in Part Three, and

b) to choose certain representative coefficients to be tested in relation to the economic variables, if there are high correlations between coefficients.

Of the two sets of equations whose results are shown below one can recognize readily:

a) the one which allows the trend of the educational profile of a given occupational category to be plotted

$\log (Ljk/X) = \log a + b \log (Lj/X)$ See Table C.1

Here elasticities must be compared within each occupational group, i.e., "horizontally", so as to obtain some idea of the respective trends of the different Ljk's as functions of Lj;

b) a second set of equations which makes it possible to determine the occupational choice of graduates at all levels:

$\log (Ljk/X) = \log a + b (Lk/X)$ See Table C.2

Here elasticities must be compared at each level of education, i.e., "vertically", so as to obtain some idea of the respective trends of the different Ljk's as functions of Lk.

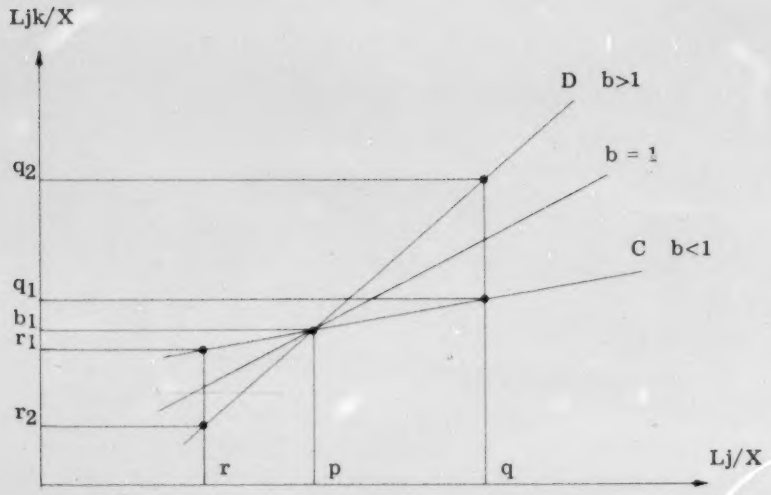
The results in Table C.1 confirm what common sense would suggest: for example, when the number of "professional and technical workers" per unit of output (Lj/X) rises, those with the lowest level of education are mainly responsible for this increase: b = 1.6 at D level and b = 0.9 at C level. Furthermore, the high elasticities at the "eight years' schooling or less" level show that this is a general rule for any occupational group, one exception, however, being group 2, where the proportion of university graduates per unit of output (Ljk/X) also tends to rise rapidly.

Table C.1. REGRESSION EQUATIONS LINKING "WEIGHTED" OCCUPATIONAL COEFFICIENTS (Ljk/X) TO OCCUPATIONAL COEFFICIENTS (Lj/X)

$$\log (Ljk/X) = \log a + b \log (Lj/X)$$

OCCUPATIONAL CATEGORIES	DEGREE LEVEL AND ABOVE (A)				COMPLETED SECONDARY SCHOOLING AND ABOVE (B)				MORE THAN EIGHT YEARS OF SCHOOLING (C)				EIGHT YEARS OF SCHOOLING AND LESS (D)			
	N	R	log a	b(σ b)	N	R	log a	b(σ b)	N	R	log a	b(σ b)	N	R	log a	b(σ b)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Major Group 0	25	0.44	-0.28	0.74(0.32)	21	0.81*	-0.04	0.89(0.15)	17	0.93*	0.00	0.93(0.10)	17	0.67*	-1.83	1.63(0.47)
Minor Groups 00/01/02/0X .	19	0.57*	-0.24	0.64(0.22)	14	0.67*	0.17	0.58(0.18)								
Minor Group 0X	12	0.34	-1.30	0.59(0.52)	9	0.86*	-0.17	0.81(0.18)								
Major Group 1	25	0.61*	-0.84	0.86(0.23)	21	0.73*	-0.06	0.67(0.15)	17	0.89*	-0.09	0.85(0.11)	17	0.88*	-0.85	1.35(0.19)
Major Group 2	25	0.64	-2.89	1.69(0.42)	21	0.44	-0.10	0.73(0.34)	17	0.87*	0.42	0.61(0.09)	17	0.94*	-1.85	1.82(0.17)
Major Group 3	25	0.35	-1.23	0.42(0.24)	21	0.20	0.23	0.21(0.24)	17	0.56*	0.44	0.35(0.14)	17	0.99*	-0.84	1.38(0.06)
Major Groups 7/8					21	-0.06	0.81	-0.09(0.38)	17	0.28	0.73	0.25(0.23)	17	0.99*	-0.90	1.35(0.06)

Can it be concluded that there is some substitution between quantity and quality of output per unit of output? It would seem so, judging by the following graph:



Line D represents the function Ljk/X = f (Lj/X) for the "eight years' schooling or less" level (D): the elasticity is higher than 1, and the constant is negative.

Line C represents the function Ljk/X = f (Lj/X) for the "more than eight years' schooling" level (C): the elasticity is between 0 and 1, the constant is positive.

When Lj/X takes position p, we obtain: Ljk/X (at C level) = Ljk/X (at D level) = 1/2 Lj/X. If Lj/X rises to assume position q, level D will then become better represented than level C in Lj (q2 > q1); on the other hand, if Lj/X falls to assume position r, it will be at the cost of a relative improvement in level C as compared with level D (r2 < r1).*

* One important point is that it is the relative positions of C and D levels which change places, Ljk/X rising (or falling) simultaneously for both levels: the elasticity at C level is not negative, but lies between 0 and 1.

Table C.2. SIMPLE REGRESSION EQUATIONS LINKING "WEIGHTED" OCCUPATIONAL COEFFICIENTS (Ljk/X) TO EDUCATIONAL COEFFICIENTS (Lk/X)

$$\log (Ljk/X) = \log a + b \log (Lk/X)$$

OCCUPATIONAL CATEGORIES	DEGREE LEVEL AND ABOVE (A)				COMPLETED SECONDARY SCHOOLING AND ABOVE (B)				MORE THAN EIGHT YEARS OF SCHOOLING (C)				EIGHT YEARS OF SCHOOLING AND LESS (D)			
	N	R	log a	b(σ b)	N	R	log a	b(σ b)	N	R	log a	b(σ b)	N	R	log a	b(σ b)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Major Group 0	25	0.95*	-0.04	0.86(0.06)	21	0.77*	0.27	0.61(0.12)	17	0.78*	-0.12	0.76(0.16)	17	0.68*	-1.18	0.69(0.20)
Minor Groups 00/01/02/0X .	19	0.80*	-0.60	0.82(0.15)	14	0.41	0.17	0.29(0.19)								
Minor Group 0X	12	0.64	-2.18	1.19(0.46)	9	0.48	-1.11	0.84(0.58)								
Major Group 1	25	0.79*	-0.87	0.90(0.15)	21	0.72*	-0.57	0.70(0.15)	17	0.74*	-1.12	0.97(0.23)	17	0.38	-0.20	0.34(0.22)
Major Group 2	25	0.87*	-1.82	1.57(0.19)	21	0.85*	-1.12	1.23(0.17)	17	0.81*	0.14	0.62(0.12)	17	0.63*	-0.45	0.57(0.18)
Major Group 3	25	0.75*	-1.74	1.13(0.21)	21	0.76*	-1.70	1.27(0.25)	17	0.73*	-0.93	0.94(0.23)	17	0.69*	-0.84	0.84(0.23)
Major Group 7/8					21	0.70*	-2.17	1.54(0.37)	17	0.76*	-1.45	1.30(0.29)	17	0.54	0.37	0.60(0.24)

Turning now to Table C.2, it will be noted that at all levels of education elasticities are higher for the lower categories on the occupational ladder (clerical workers, sales workers, manual workers and craftsmen) than for the others: an increase in the number per unit of output thus operates in favour of the less highly educated categories, whose relative position is improved. Elasticities in the higher categories are of course positive: that is to say, Ljk/X continues to rise, although more slowly, as Lk/X rises.

Interesting as these findings are, they refer us back to the main problem, namely, that of the links between the coefficients and economic variables. Are the values of these coefficients low, as might legitimately be supposed, in countries with a high capital density and a highly efficient work organisation, where full dissemination of information is taken for granted? Or are there some "structural" factors which may affect the value of the coefficients?

ii) The Coefficients and Economic Variables

As pointed out in the introduction, a vital step is to determine the direction and causal factors of changes in the occupational or educational coefficients (Lj/X or Lk/X). There is no need to point out the direct relationship they establish between the occupational category and/or level of education, on the one hand, and a fundamental economic aggregate, on the other. They are the equivalents of the Leontieff-type technical coefficients.

At the same time, some understanding is needed of variations in these coefficients. For instance if the "professional and technical workers" category is considered, it can be postulated that the number needed for the production of one million dollars' worth of output (Lj/X) is primarily a function of the level of development attained. It can thus be assumed that in an industrialized country, activity will be more capital-intensive, the organisation of work will be better, especially owing to the presence of middle-level technical personnel, and, as a result, the "individual effectiveness" of the professional worker will be greater: hence Lj/X will be low. Conversely, the need for professional workers per unit of output in the developing countries will be high owing to the absence of communications, faulty job distribution, the often small-scale craft nature of production, etc. Graph C.3, where the level of development is represented by the GDP per capita income X/P, only partially confirms these assumptions. While the industrialized countries are closely aligned, with Lj/X ranging from 100 in Yugoslavia to 15 in the United States, the scatter for the other countries is harder to interpret; the negative correlation is less clear, with a number of countries clustered round Lj/X = 50.

The regression equation for Graph C. 3 is as follows:

$$\log (Lj/X) = 2.92 - 0.29 \log (X/P) \qquad R = 0.67$$
$$(0.07) \qquad N = 25$$

If this type of equation were to be used for an industrialized country, there would obviously be an advantage in choosing a sub-sample for this type of country; for the developing countries, account would have to be taken of the constancy of Lj/X - lying between 40 and 60 - up to a GDP per capita of $ 700. This is not, in fact, due to classification problems, in view of the size of the category considered. A still more disturbing factor is this: if Lj/X - j representing scientific and technical workers - is matched with X/P, there is no relationship whatsoever, as shown by the following equation:

$$\log (Lj/X) = 0.48 + 0.08 \log (X/P) \qquad R = 0.13$$
$$(0.15) \qquad N = 19$$

The relative alignment noted for major group 0 as a whole is thus largely to the non-scientific categories, for which the hypothesis of a strict direct link with production is hardest to uphold.

Similar results were obtained with "administrative and executive workers ...", for which we find:

$$\log (Lj/X) = 2.20 - 0.24 \log (X/P) \qquad R = 0.36$$
$$(0.13) \qquad N = 25$$

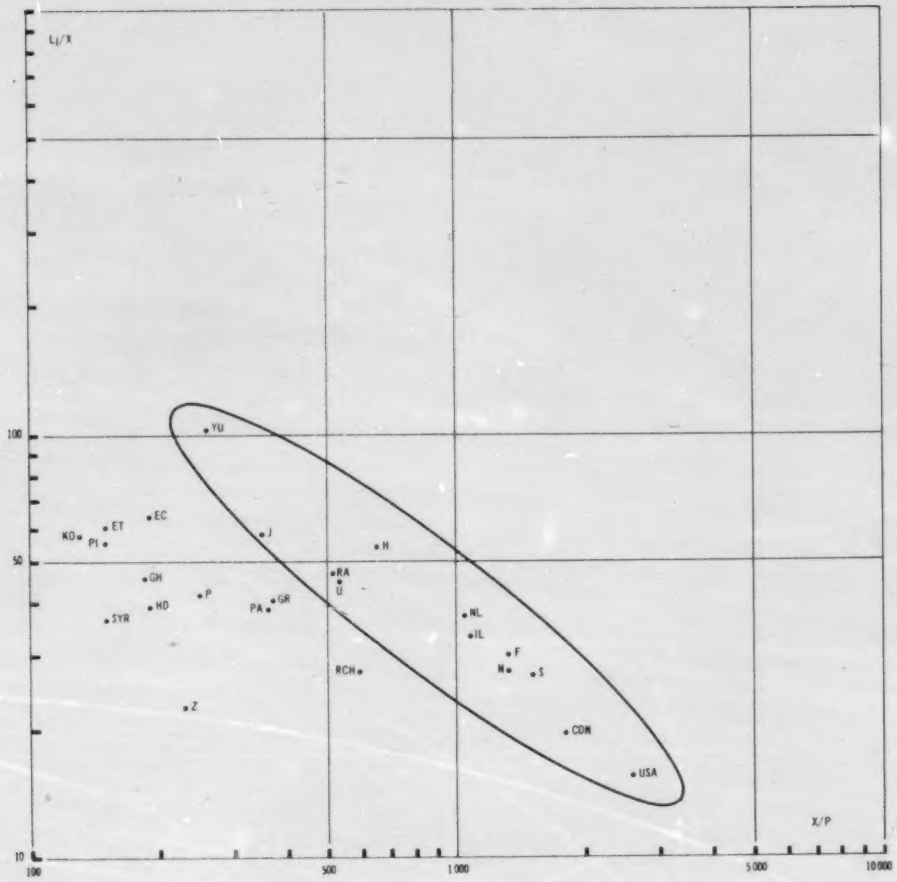
In this case, however, the problems of classification could justly be incriminated, although they should confirm rather than contradict the general rule that fragmented production structures, and thus high Lj/X's, coincide with low GDP per capita, while the integrated structures are the prerogative of advanced countries.

In the face of these meagre results, it may be noted a) that it is less the occupational coefficients which should be linked with the level of development than the same coefficients weighted by the level of education Ljk/X, the latter being the real indicator of the level of qualications, while the occupational category serves only for classification purposes; and b) that the level of development expressed by X/P may not be a precise indicator of the level of technology, which should be more exactly calculated by using more specific variables.

These observations do not, however, take us much further forward, to judge from the following statistical results. No significant correlation was found for Ljk/X, whatever the level of education considered.

Graph C-3

NUMBER OF «PROFESSIONAL AND TECHNICAL WORKERS» PER UNIT OF OUTPUT (L_j/X), AND GDP PER CAPITA (X/P)



Moreover, it was decided to represent the level of technology by the sum of recent investments ΣI, or by the proportion of exports in gross product E/X, as providing a good indication of the competitivity of an economy with respect to others; as such E/X would reflect not only the level of technology, but also the general degree of organisation of an economy, the quality of its management, etc.

A few results follow which, to say the least, do not confirm the above hypotheses:

$$\log (Ljk/X) = 0.45 + 0.05 \log \Sigma I \qquad (0.09)$$

R = 0.12
N = 22
j = major group 0
k = university-degree level or above

$$\log (Ljk/X) = 0.57 - 0.22 \log (E/X) \qquad (0.25)$$

R = 0.21
N = 19
j = sub-groups 00/01/02/0X
k = university-degree level or above

$$\log (Ljk/X) = 1.72 - 0.28 \log (E/X) \qquad (0.16)$$

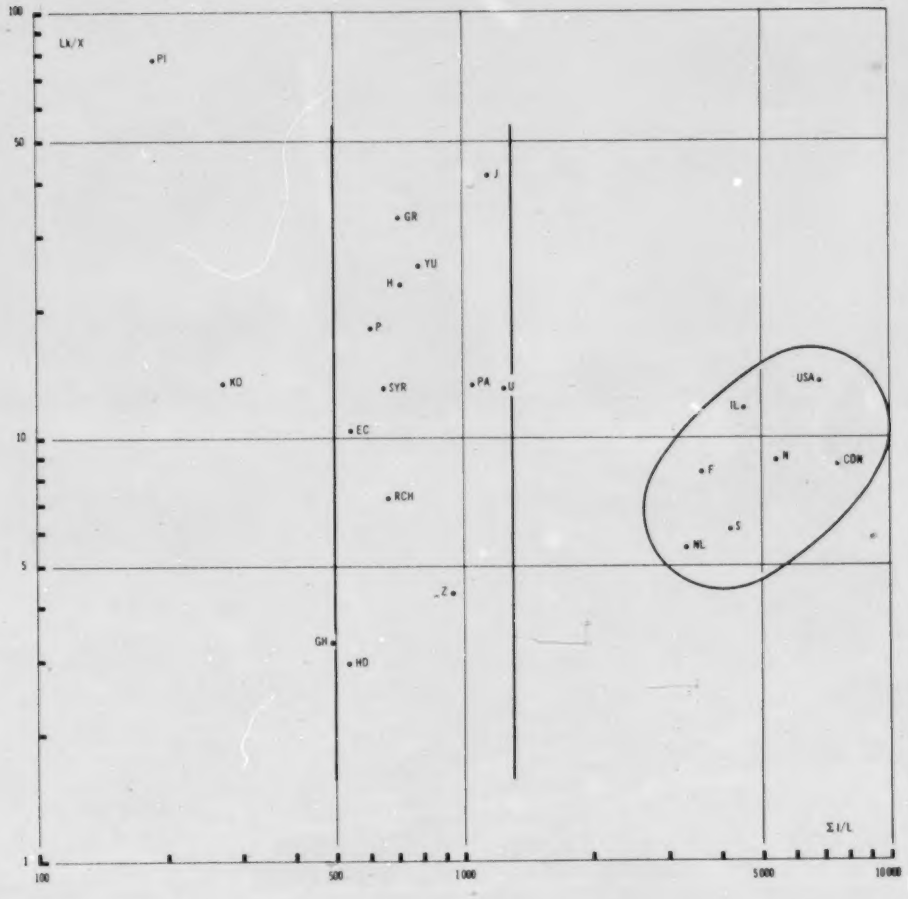
R = 0.37
N = 21
j = major group 0
k = completed secondary level or above

These results do not even enable the sign of the correlation to be unambiguously determined. Before concluding that the variables are independent, we will examine Graphs C.4 and C.5, on which an economic variable and an educational coefficient (Lk/X) were plotted in the hope that if all graduates were taken into account there might be some improvement in the correlations. It will be seen that nothing of the kind happened.

Graph C.4, drawn up with $\Sigma I/L$, shows instead that the number of university graduates for one million dollars' worth of output varies from 3 to over 40 for between $500 and $1,300 invested per head. On the same graph, moreover, the developed countries are aligned around a mean position (Lk/X = 8); the correlation tends to be positive, so as to suggest that the density of capital required an increase in the input of qualified manpower per unit of output.

Graph C-4

NUMBER OF PERSONS WITH «UNIVERSITY DEGREE» PER UNIT OF OUTPUT (Lk/X), AND GROSS CAPITAL FORMATION PER WORKER (ΣI/L)



In Graph C. 5, the points are also widely scattered, nor can the industrialized countries be dissociated from the others. The slope of the fitted line, although not precisely determined, is nevertheless clearly negative, as the following equation indicates:

$$\log (Lk/X) = 2.31 - 0.41 \log (E/X) \qquad (0.19)$$

R = -0.44
N = 21
k = completed secondary level or above

Lastly, two other explanatory variables were tested: first, the gross domestic product X, in the hope of taking account of economies of scale; a sufficiently large X would at first sight appear to be the requisite for an extreme division of labour resulting in low Lk/X's. No satisfactory results were obtained here.

Second, the total population P may be thought to influence the value of Lk/X; with the object of confirming the pressure of demography on the value of the coefficients, Lk/X = f (P) was tested. Curiously enough, the results are "better" at university-degree level:

$$\log Lk/X = 1.33 + 0.24 \log P \qquad (0.11)$$

R = 0.40
N = 25

than at the "more than eight years' schooling" level:

$$\log Lk/X = 2.22 + 0.11 \log P \qquad (0.09)$$

R = 0.29
N = 17

although normally the latter should be more closely affected by the demographic pressure, if any, than the university-degree level.

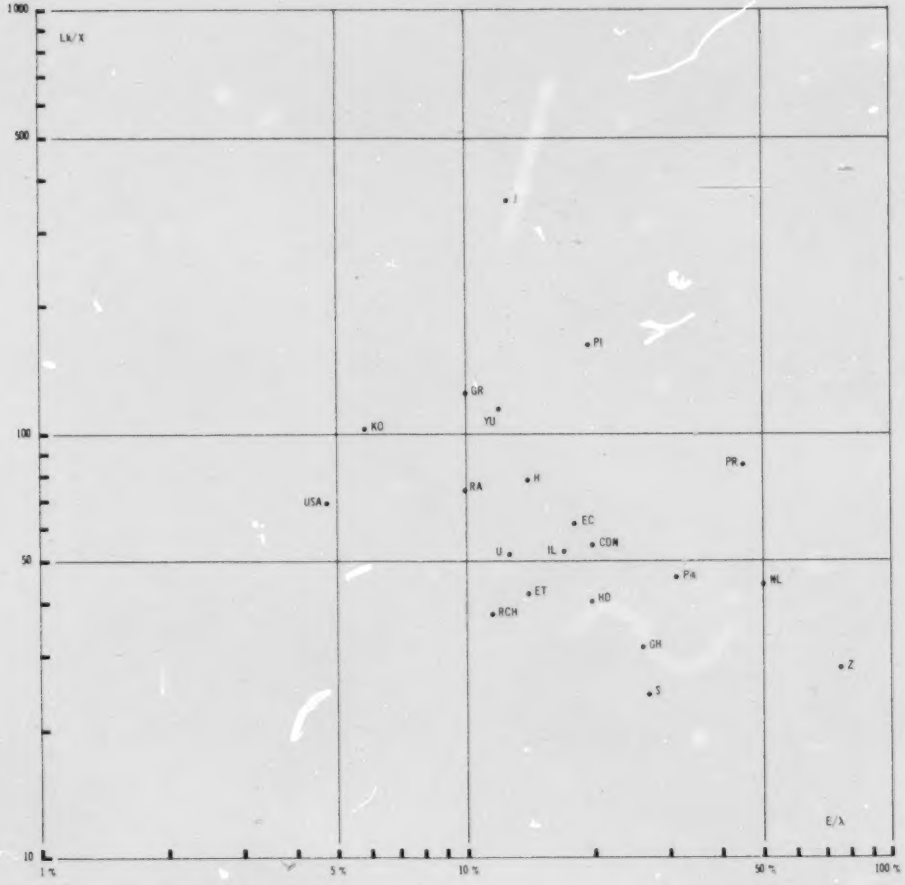
International comparisons at the macro-economic level thus do not enable any rules, [illegible] most general kind, to be formulated regarding the co[illegible] of coefficients, with the possible exception of some [illegible] elations between Lj/X and per capita income, and here for certain occupational categories alone. It must be concluded that factors other than the macro-economic indicators affect the behaviour of these coefficients through a complex relationship which remains to be determined.

iii) The Coefficients and Labour Productivity

As mentioned in the introduction, one advantage of analysing the coefficients was that this allowed forecasting with no reference to

Graph C-5

NUMBER OF PERSONS WITH «COMPLETED SECONDARY SCHOOLING AND ABOVE» PER UNIT OF OUTPUT (Lk/X), AND EXPORTS SHARE IN GDP (E/X)



employment or labour productivity. There is another reason which renders the calculations using X/L as an explanatory variable in the double-logarithmic equations unnecessary: the parameters of the Lk/X = f (X/L) type equations can, indeed, be directly deduced from those of the equations in the form Lk/L = f (X/L), the results of which are shown in Chapter X.

These three variables are, in fact, linked by the tautological relationship:

(1) $(Lk/L) \equiv (Lk/X)\ (X/L)$

which may also be written:

(2) $\log (Lk/L) \equiv \log (Lk/X) + \log (X/L)$

The two regression equations in double-logarithmic form are as follows:

(3) $\log (100\ Lk/L) = \log a_o + a_1 \log (X/L)$

(4) $\log (Lk/X) = \log b_o + b_1 \log (X/L)$

If equations (3) et (4) are inserted in identity (2), this gives:

(5) $\log a_o + a_1 \log (X/L) = \log b_o + b_1 \log (X/L) + \log (X/L) + \log 100$

which may also be written:

(6) $\log a_o + a_1 \log (X/L) = (b_1 + 1) \log (X/L) + \log b_o + 2$

If (6) is to stay an identity, one must have:

$\log a_o = \log b_o + 2$

$a_1 = b_1 + 1$

It therefore serves no purpose to recalculate the equations Lk/X = f (X/L) when we have the parameters of the equations Lk/L = f (X/L). In the absence of statistical calculations, then, it may be of value to consider a few graphs showing the coefficients and labour productivity; the correlations, which are generally not as good as those obtained with the percentages, may, indeed, give some interesting new insights.

The occupational coefficients Lj/X are shown opposite X/L on Graph C. 6 for the "administrative and executive workers" category. We all know that this occupational group is not only very heterogeneous, but poses serious problems of classification. Be this as it may, the graph justifies the assumption of constant coefficients for two sub-samples: in the first and most important, the number of managerial workers for one million dollars' worth of output would be roughly ten for countries whose productivity ranges form $ 500 to $ 7,000 per head* in the second, which includes only developing countries, Lj/X would be somewhere around 20. This constancy of Lj/X probably conceals a two-way process: as X/L rises, the falling trend in Lj/X due to the rapid decline in the numbers of working proprietors in industry is offset by the equally rapid increase in the numbers of independent service workers.

Graph C. 7 refers to scientific and technical workers with university degrees. As noted in the previous section, there is no strict link between Ljk/X and the economic variables. It should here be noted, however that the scatter of Ljk/X, which is very pronounced at low levels of productivity**, tends to diminish more and more, especially from the $ 2,000 and over productivity level. Does this mean that the utilisation pattern of qualified scientific workers, which is often limited in the non-industrialized countries, is increasing as development proceeds, and that direct econometric links with X/L, may appear as a result? It would be rash to answer in the affirmative, failing an exhaustive study of the utilisation pattern of such manpower. At the same time, in the developing countries, it seems clear that an over-large proportion of scientists are employed in services.

Graph C. 8 showing clerical workers with more than eight years' schooling, clearly reveals two alignments. The first has a negative elasticity in relation to X/L. If the second*** is to be believed, Ljk/X declines still faster every time X/L moves up (elasticity close to -1); in other words, the efficiency of this manpower group is rapidly improving. To which of these two sub-samples a given country belongs should be decided on the basis of a thorough knowledge of the country's present and recent employment structure.

The analysis of these graphs could easily be taken further, but it would soon lose its value. The identification of sub-samples represents

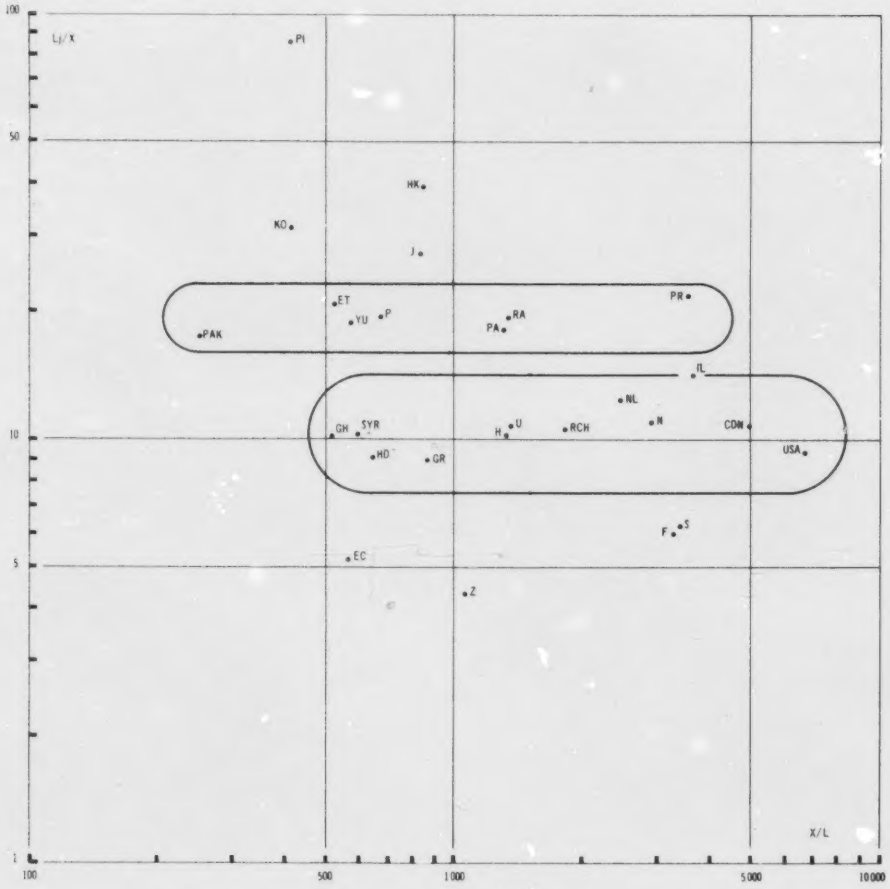
* It will be noted that this sample includes all the industrialized countries, except France and Sweden. For these two countries, Ljk/X lies between six and seven. Here we probably come up against problems of classification.

** Ljk/X varies from 0. 5 to 10 for the values of X/L between $ 500 and $ 1, 000: see Graph C. 7.

*** Which should be confirmed by further observations. The sample covers only largely under-developed countries.

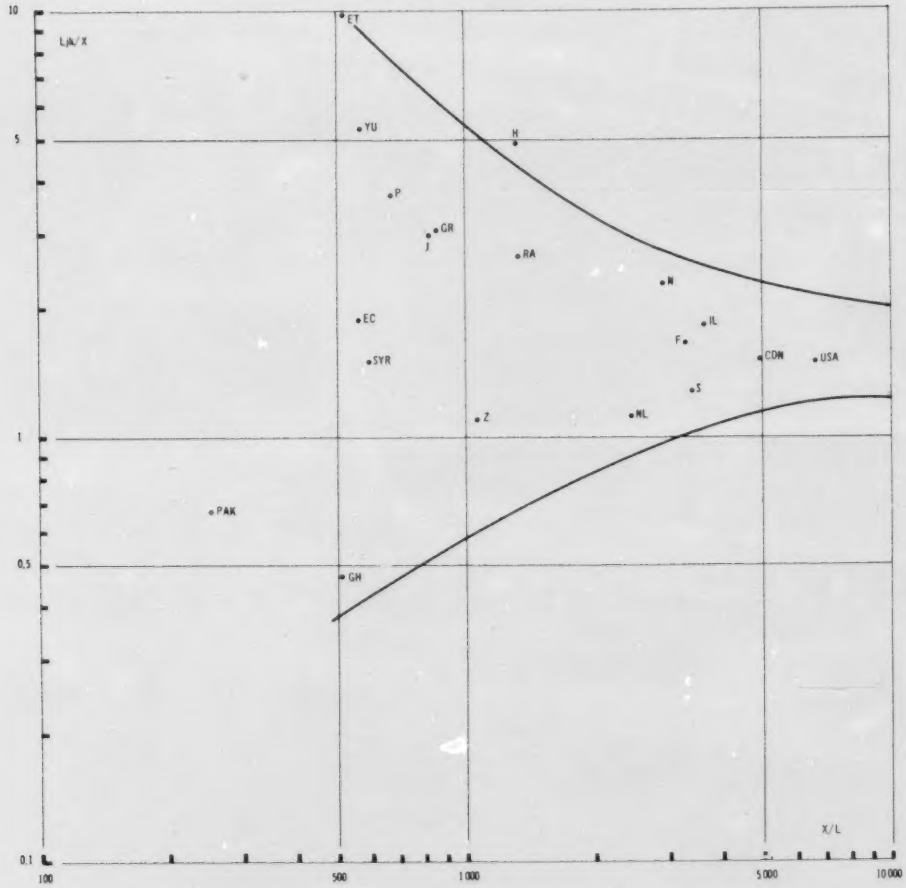
Graph C-6

NUMBER OF ‹ADMINISTRATIVE, EXECUTIVE AND MANAGERIAL WORKERS› PER UNIT OF OUTPUT (L_j/X), AND OUTPUT PER WORKER (X/L)



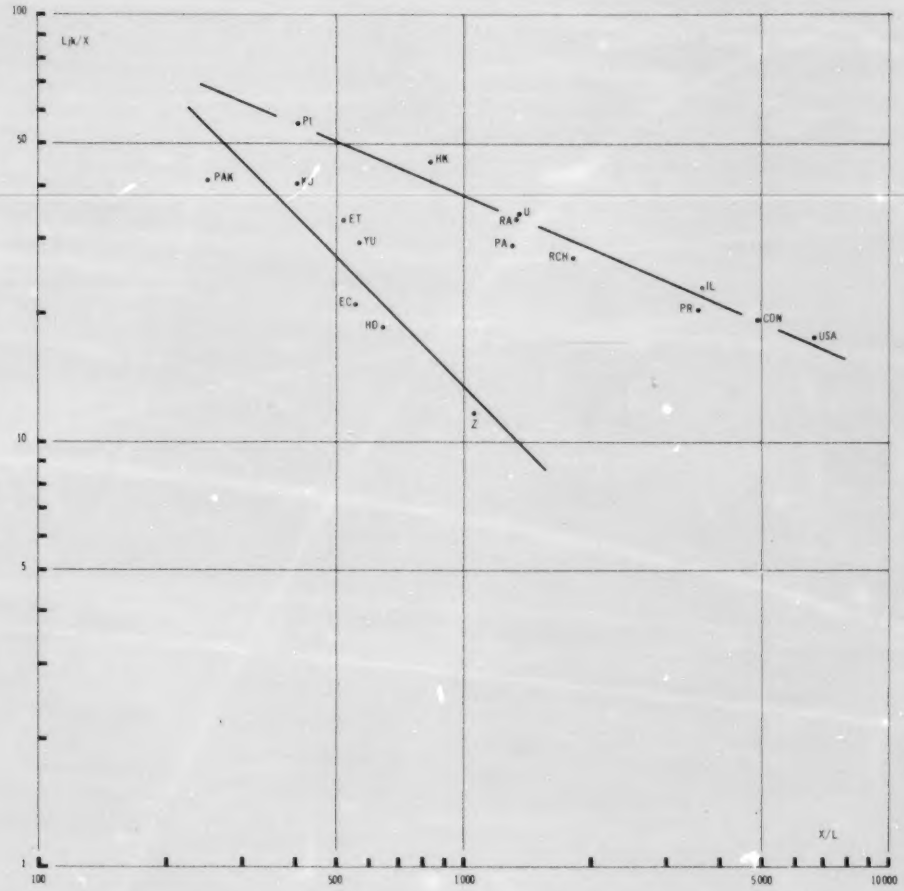
Graph C-7

NUMBER OF «SCIENTIFIC AND TECHNICAL WORKERS» WITH «UNIVERSITY DEGREE» PER UNIT OF OUTPUT (Ljk/X), AND OUTPUT PER WORKER (X/L)



Graph C-8

NUMBER OF «CLERICAL WORKERS» WITH «MORE THAN EIGHT YEARS OF SCHOOLING» PER UNIT OF OUTPUT (Ljk/X), AND OUTPUT PER WORKER (X/L)



only one phase which, however worthwhile it may be, teaches us little about the causes and factors responsible for the very different values assumed by the coefficients in different countries.

More generally, we have not succeeded in this section in bringing out the laws governing variations in the occupational and/or educational coefficients. True these tend to diminish (or at most remain constant) as development proceeds, whatever the indicators used. The indicators are however far from satisfactory, and do not clearly account for the trend of the coefficients.

There seem to be two possible explanations for such poor results. The first relates to substitutions at all stages between different occupational categories and different levels of education; this process may have become so generalized that any international comparison is impossible, each country having its own occupational and/or educational structures which depend on certain factors peculiar to it: organisation to work, occupational descriptions, "vocational value" attached to the educational system, etc.

We acquired the conviction that substitution in all its forms was not a valid explanation in this case; as regards occupational groups, these are sufficiently large to eliminate the factor.* As regards levels of education, we have repeatedly noted that a country "under-educated" at one level is under-educated at other levels; the assumption that one university graduate can be "replaced" by two or three people who have completed their secondary education is, in fact, never confirmed.

The second and, we think, more plausible explanation resides in the problems of utilization of qualified manpower. Apart from his occupational group and level of instruction, a worker is defined more particularly by the function he performs (research, distribution, production, etc.), the branch of the economy in which he works**, not to mention more elusive organisational factors.

3. ANALYSIS OF THE SECTORAL EDUCATIONAL COEFFICIENTS

The approach which consists of adjusting the educational level of economic sectors, represented by percentages (Lik/Li or Lik/L), with

* It is intuitively clear that the smaller the categories the more feasible the substitutions. We saw this in the case of such a category as technicians, for which few positive results were obtained.

** The fact that, in developing countries, many scientists work in low productivity sectors (services), not in productive branches of the economy, may explain a great deal.

technological indicators, is certainly the easiest one to apply at the various stages of what has come to be called "the manpower forecasting approach for quantifying the economic aims of education".

Let us briefly recall the successive phases of this method. Its aim is:

1) to determine the trend of GDP by sectors during the next ten or fifteen years;

2) to work out the general trends of sectoral labour productivity;

3) to deduce employment by sectors by comparing 1) and 2);

4) to break down this sectoral employment by major occupational categories for the base year and the end year and, after subtracting survivors, to deduce the numbers of new entrants by categories;

5) lastly, to apply to each category a given educational profile and, by aggregation, to calculate the total educational needs during the forecast period.

There has never been any lack of support for a procedure which would be both simpler and quicker. Baldly stated, this requires either the elimination of stage 4, i.e., the breakdown by occupational categories, or the still more radical elimination of stages 2, 3 and 4, by proceeding direct from the product (total or sectoral) (stage 1) to requirements by educational levels (stage 5).

We dealt with the first type of such a "short cut" at length in the First Volume; it is the second which interests us here.

The simplest method of "bypassing" both employment by sectors (and thus sectoral productivity) and the breakdown by occupational categories is to relate the numbers with a given level of education in a given sector directly to sector output, i.e., Lik/Xi (Xi in millions of US dollars, 1960). We shall call this type of ratio the "sectoral educational coefficient".

The advantage in analysing these coefficients as done here is twofold.

From the static aspect, an international comparison of the inputs of qualified manpower per unit of sectoral output may bring out certain similarities or differences between countries whose analysis may prove of value. Insofar as these coefficients reflect utilization patterns of skilled manpower in a given sector, their relative values will of course be highly important.

The comparison of two series of coefficients for different educational categories should also make it possible to determine whether any substitution effects exist between levels of education.

From the dynamic standpoint, a knowledge of the laws governing the changing (or constant) trend of the coefficients is clearly of primary importance for forecasting purposes.

We will first, briefly consider the existing links between sectoral educational coefficients (Lik/Xi) and general educational coefficients (Lk/X). The different Lik/Xi's will then be related to some economic indicators. Lastly, a rapid graphic analysis of the coefficients with sectoral productivity will be made.

i) Sectoral Educational Coefficients and Overall Educational Coefficients

We have already briefly referred to the trend of the different educational coefficients: Lk/X. The number of qualified workers per unit of total output is, however, but the weighted resultant of the number of qualified workers per sector and per unit of sectoral output. If, then, Lk/X is regarded as a measurement of the utilization pattern of qualified manpower in the economy as a whole, very different trends may be encountered in separate sectors; and some may be more responsible than others for the values assumed by Lk/X in the economy as a whole.

It is thus not without interest to study the trend for the different Lik/Xi's as a function of Lk/X. We shall test, for each sector, a series of equations in the form:

$$\log (Lik/Xi) = \log a + b \log (Lk/X)$$

showing how the utilization of qualified manpower at the sector level reacts when it changes in the economy as a whole.

The results of these equations are shown in Table C.3. The usually excellent correlations give no cause for surprise: since Lik/Xi is contained in Lk/X, they are partly artificial.

The regression coefficients are more interesting, expecially if a "vertical" comparison is made between them at each level of education; it will thus be seen that they are always lowest for the manufacturing sector* and highest for transport**, those for commerce taking an intermediate value.

* Ranging from 0.65 to 0.90, according to the level of education considered.
** Ranging from 1.00 to 1.50, according to the level of education considered.

Table C.3. SIMPLE REGRESSION EQUATIONS LINKING THE SECTORAL EDUCATIONAL COEFFICIENTS (Lik/Xi) TO THE EDUCATIONAL COEFFICIENTS (Lk/X)

$$\log (Lik/Xi) = \log a + b \log (Lk/X)$$

ECONOMIC SECTORS	DEGREE LEVEL AND ABOVE (A)				COMPLETED SECONDARY SCHOOLING AND ABOVE (B)				MORE THAN EIGHT YEARS OF SCHOOLING (C)				EIGHT YEARS OF SCHOOLING AND LESS (D)			
	N	R	log a	b(σ b)	N	R	log a	b(σ b)	N	R	log a	b(σ b)	N	R	log a	b(σ b)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Manufacturing	18	0.87*	-0.24	0.89(0.12)	13	0.81*	-0.02	0.89(0.20)	10	0.76*	0.70	0.65(0.20)	10	0.94*	0.40	0.80(0.10)
Commerce ..	16	0.93*	-0.36	1.08(0.11)	11	0.88*	-0.16	1.03(0.19)	10	0.80*	0.74	0.62(0.16)	10	0.92*	0.31	0.75(0.11)
Transport ..	18	0.94*	-1.04	1.47(0.14)	13	0.87*	-0.45	1.17(0.20)	10	0.83*	-0.05	1.00(0.24)	10	0.93*	0.51	0.73(0.10)

52

In other words, when the utilization of qualified manpower worsens (Lk/X rises), it worsens less rapidly in the productive sectors than in the others.

ii) Sectoral Educational Coefficients and Economic Variables

The object here is to describe a few econometric relationships linking the educational coefficients for the manufacturing sector with some economic indicators.

Reverting to the line of thought already expounded in Part Three, we thought at first that the value assumed by Lik/Xi depended on the level of development, there being every liklihood that qualified manpower would be better used (Lik/Xi low) in the industrialized countries than in others.

It is also certain that the value of Lik/Xi depends on the absolute size of the sectoral output Xi: the higher the latter the greater the likelihood of economies of scale, leading to low educational coefficients. Lastly, it was considered that the level of technology as indicated by the proportion of exported manufactured goods in sectoral output, Ei/Xi, might have some influence on the value of those coefficients.

At "university degree level or above", the preceding considerations led to the following results (with 18 observations):

(1) $\log (Lik/Xi) = 1.44 - 0.24 \log (X/P)$ $\quad R=0.33$
$\qquad\qquad\qquad\qquad\qquad\quad (0.17)$

(2) $\log (Lik/Xi) = 1.40 + 0.28 \log Xi - 0.55 \log (X/P)$ $\quad R=0.68$
$\qquad\qquad\qquad\qquad\quad (0.09) \qquad (0.17)$

(3) $\log (Lik/Xi) = 1.40 + 0.32 \log Xi - 0.55 \log (X/P) - 0.12 \log (Ei/Xi)$ $\quad R=0.73$
$\qquad\qquad\qquad\quad (0.09) \qquad (0.17) \qquad (0.08)$

There is, therefore, no significant statistical link between the educational coefficients and per capita income; correlation, on the other hand, is considerably improved by the introduction of Xi: X/P and Xi between them account for nearly 50% of the variance for Lik/Xi. As for the variable Ei/Xi, it does little to improve the correlation, while its elasticity is not significant.

It would be rather difficult to confirm these results for any other level of education in this sector. Thus, taking the numbers with "more than eight years' schooling", we obtained (with 10 observations):

$$\log (Lik/Xi) = 2.48 - 0.16 \log (X/P) \qquad R = 0.35$$
$$(0.15)$$

$$\log (Lik/Xi) = 2.46 + 0.09 \log Xi - 0.25 \log (X/P) \qquad R = 0.49$$
$$(0.08) \qquad (0.17)$$

It will be seen that the correlations are low and the regression coefficients are non-significant. Even poorer results would be obtained for "completed secondary level or above", where there is almost perfect independence between Lik/Xi and X/P. These results are rather discouraging, except at "university degree level".

Our conclusion must be the same as that arrived at in the preceding Section. A fraction of the variance in the sectoral coefficients can certainly be explained by macro-economic indicators. The latter, are, however, too general to account entirely for patterns of utilization; one would have to introduce additional explanatory variables, such as work functions, age structure of employment, physical environment (size of enterprises) or human environment (qualifications of auxiliary manpower), etc.

iii) Sectoral Educational Coefficients and Labour Productivity

As in the preceding Section we shall here neglect the regression analyses, as the percentages (Lik/L and Lik/Li) are linked with the coefficients (Lik/Xi) through labour productivity (Xi/Li), as shown in the following tautological relationships:

(a) $Lik/L = (Lik/Xi)\ (Xi/Li)\ (Li/L)$

(b) $Lik/Li = (Lik/Xi)\ (Xi/Li)$

As a result of the b) tautology, any function $Lik/Li = f\ (Xi/Li)$ implies another function of the form $Lik/Xi = f\ (Xi/Li)$, the parameters of which are strictly linked with those of the first function when the double-logarithmic form is used.

We can thus put:

$$\log (100\ Lik/Li) = \log a_o + a_1 \log (Xi/Li)$$

$$\log (Lik/Xi) = \log b_o + b_1 \log (Xi/Li)$$

which readily leads to:

(1) $\log b_o = \log a_o - 2$

(2) $b_1 = a_1 - 1$

We have already given a mathematical demonstration of these formulae and shall confine ourselves here to a graphic illustration.

It is fairly easy to provide graphic confirmation of formula by subdividing our sample into small groups of countries for which the elasticities show conspicuous values (determined graphically, not by calculation).

A few of these conspicuous value appear in the following table:

Chief values of elasticities for equations in double-logarithmic form

$Lik/Li = f(Xi/Li)$	and	$Lik/Xi = f(Xi/Li)$
	Illustrative graphs	
$a_1 = +\infty$	(C. 9) MA (C.10)	$b_1 = +\infty$
$+1 < a_1 = +\infty$	(C.13) TB (C.14)	$0 < b_1 < +\infty$
$a_1 = +1$	(C. 9) MA (C.10)	$b_1 = 0$
$0 < a_1 < +1$	(C. 9) MA (C.10)	$-1 < b_1 < 0$
$a_1 = 0$	(C.11) CA (C.12)	$b_1 = -1$
$-\infty < a_1 < 0$	(C.11) CA (C.12)	$-\infty < b_1 < -1$
$a_1 = -\infty$	(C. 9) MA (C.10)	$b_1 = -\infty$

Graphs C.9 and C.10, with i representing manufacturing and k university degree level, allow certain conspicuous values for a_1 and b_1 to be checked graphically.

- Thus, the group of four countries* whose productivity lies in the 800 to 1,100 dollar range per person employed has an elasticity of $\pm\infty$ in both graphs;

* Japan, the Philippines, Egypt, Syria.

- the group of six countries for which the elasticity is roughly equal to 1 in Graph C.9* clearly has an elasticity close to zero in Graph C.10 for a value of Lik/Xi of between 5.5 and 7;
- lastly, the group of six countries for which the elasticity lies between 0 and 1 in Graph C.9** appears to have a negative elasticity of more than - 1 in Graph C.10.

Similarly, it can be seen from Graphs C.11 and C.12, where i represents commerce and k university degree level, that:

- the group of five countries with zero elasticity according to Graph C.11*** - 1.2% < Lik/Li < 1.6% - are found to have an elasticity roughly equal to -1 in Graph C.12;
- six countries whose elasticity is shown in Graph C.11 as largely negative**** are found to have an elasticity distinctly lower than -1 in Graph C.12.

Lastly, Graphs C.13 and C.14 show that when the elasticity of Lik/Li in relation to Xi/Li lies between + 1 and + ∞ for any group of countries*****, the elasticity of Lik/Xi for those same countries is clearly positive.

It thus seems clearly established, mathematically and graphically, that the parameters of equations (1) and (2) are strictly interconnected; it is therefore needless to test these two types of equations in the hope of obtaining different results.

This being granted, the next purpose of graphic analysis is to ascertain whether substitution phenomena are responsible for the poor correlations between the coefficients and economic indicators.

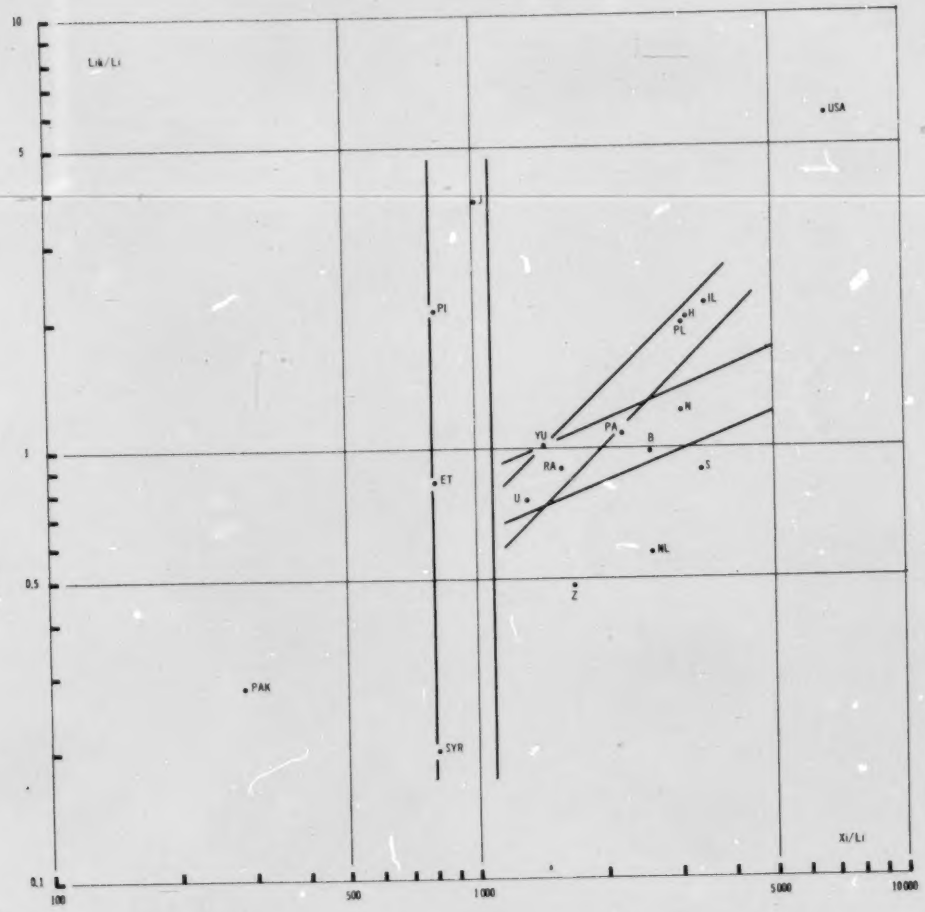
If, then, a comparison is made between Graphs C.10 and C.15 on which Lik/Xi is shown, i representing the manufacturing sector and k "university level" and "completed secondary level or above" in turn, the following points may be noted:

- Lik/Xi is higher for Japan than for other countries at both levels of education.
- Taking the United States as a standard of reference, Lik/Xi is high for the Philippines at university level, and identical at

* Israel, Hungary, Poland, Yugoslavia, Argentina, Uruguay.
** Norway, Belgium, Panama, Argentina, Yugoslavia, Uruguay.
*** Sweden, Uruguay, Argentina, Yugoslavia, Egypt.
**** Japan, the Philippines, Argentina, Yugoslavia, Uruguay, the Netherlands.
***** United States, Israel, Belgium, Uruguay, Egypt.

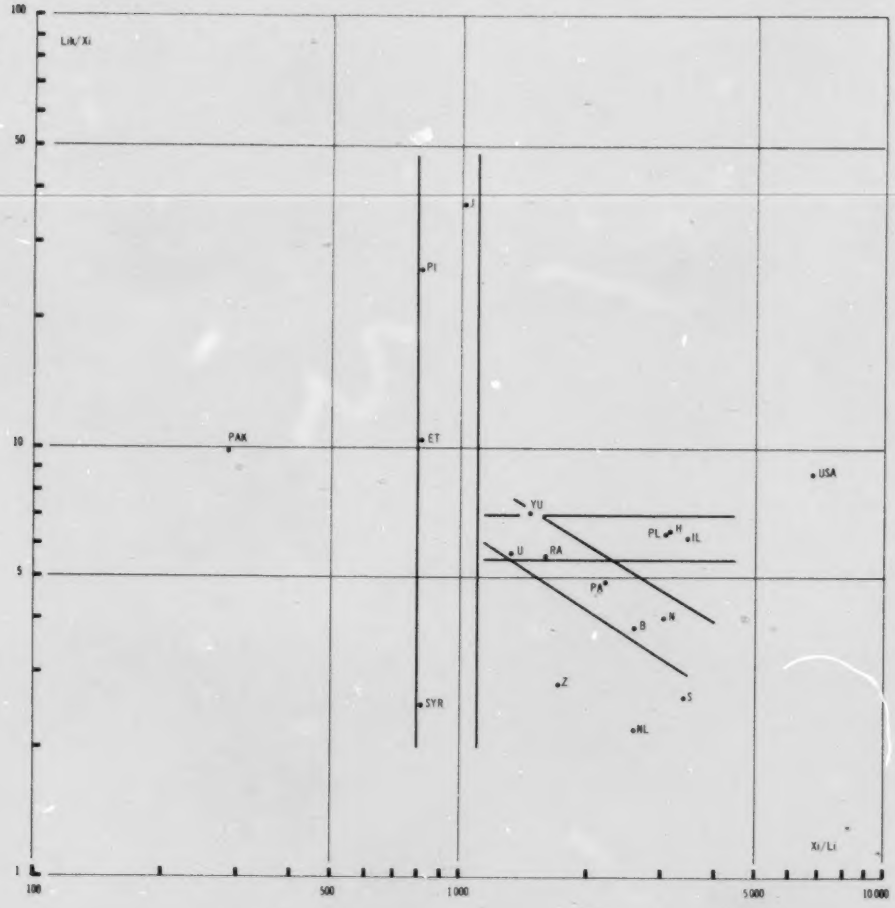
Graph C-9

MANUFACTURING : PERSONNEL WITH «UNIVERSITY DEGREE» AS A PROPORTION OF SECTORAL EMPLOYMENT (Lik/Li), AND SECTOR OUTPUT PER WORKER (Xi/Li)



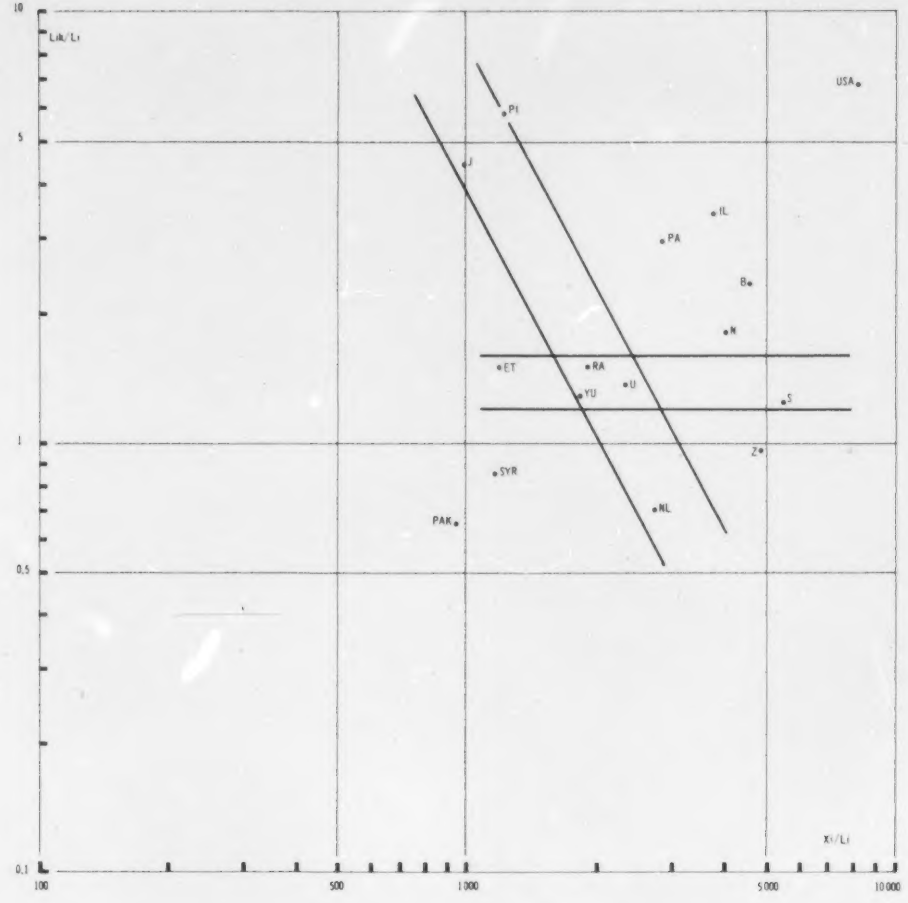
Graph C-10

MANUFACTURING - PERSONNEL WITH A «UNIVERSITY DEGREE» PER UNIT OF SECTOR OUTPUT (Lik/ Xi) AND SECTOR OUTPUT PER WORKER (Xi/Li)



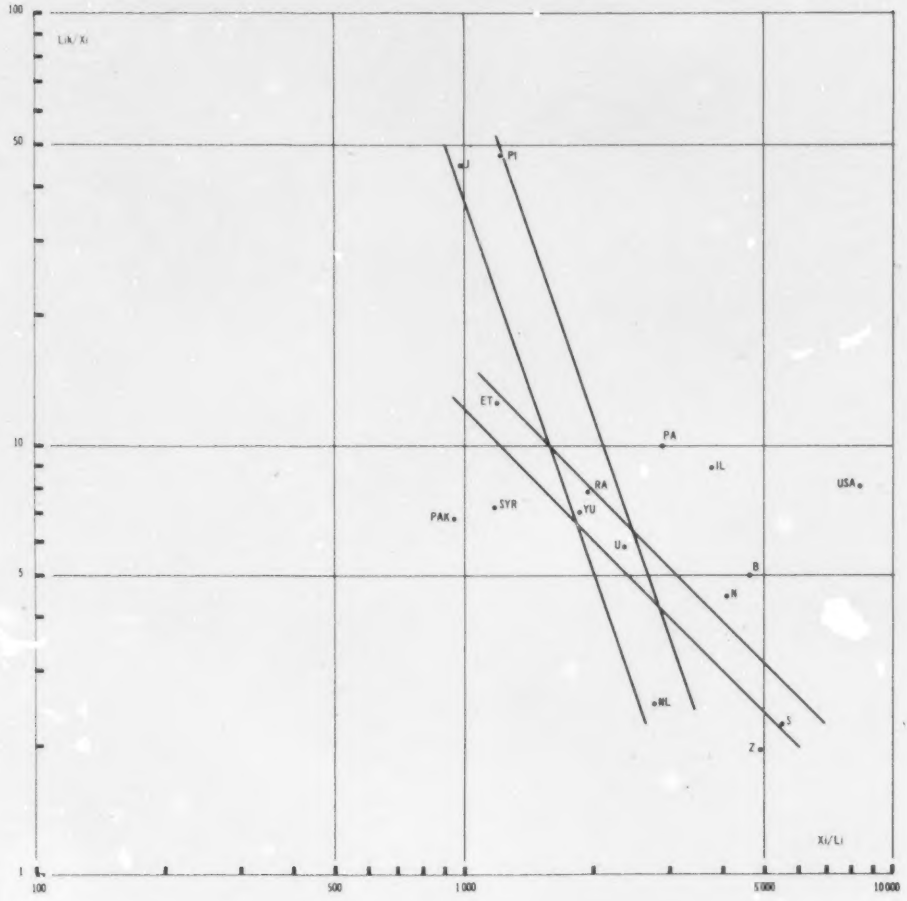
Graph C-II

COMMERCE : PERSONNEL WITH «UNIVERSITY DEGREE» AS A PROPORTION OF SECTORAL EMPLOYMENT (Lik/Li), AND SECTOR OUTPUT PER WORKER (Xi/Li)



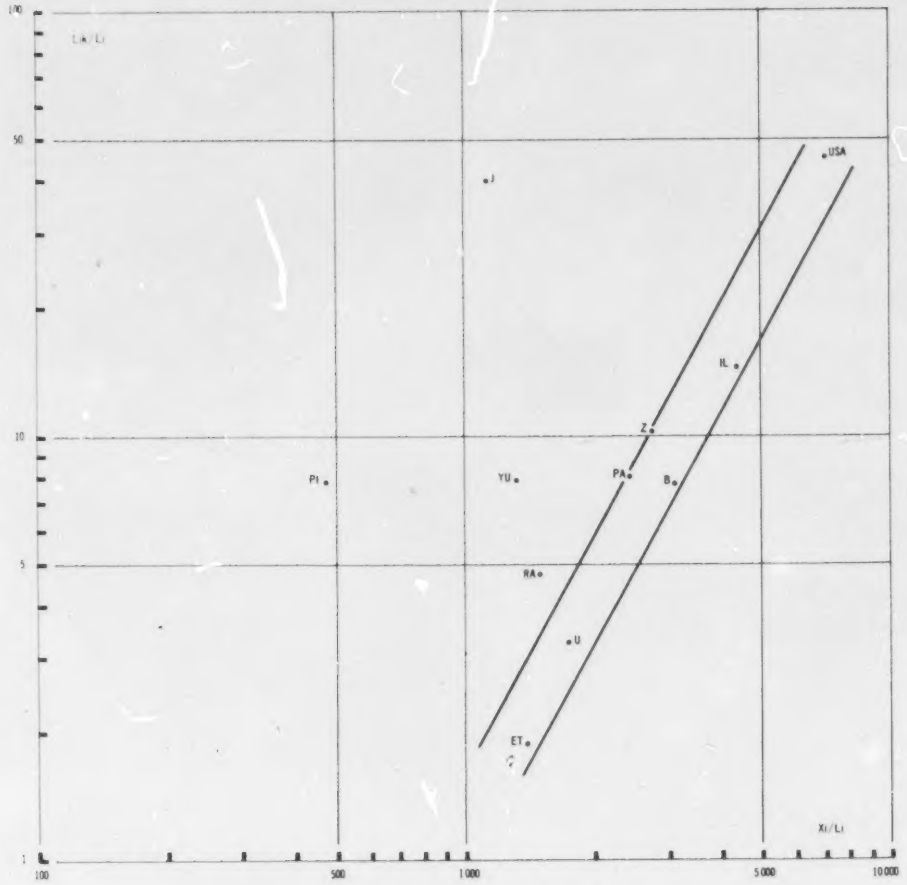
Graph C-12

COMMERCE : PERSONNEL WITH A «UNIVERSITY DEGREE» PER UNIT OF SECTOR OUTPUT (Lik/Xi), AND SECTOR OUTPUT PER WORKER (Xi/Li)



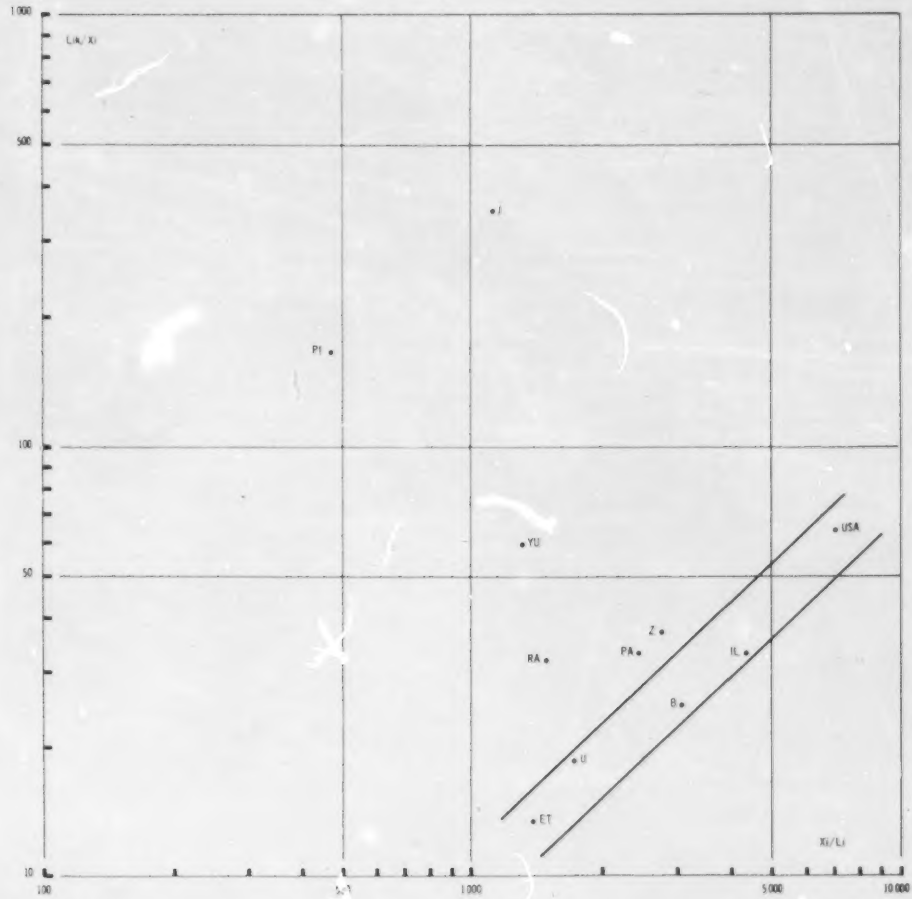
Graph C-13

TRANSPORT: PERSONNEL WITH «COMPLETED SECONDARY SCHOOLING AND ABOVE»
AS A PROPORTION OF SECTORAL EMPLOYMENT (Lik/Li), AND SECTOR OUTPUT PER WORKER (Xi/Li)



Graph C-14

TRANSPORT : PERSONNEL WITH «COMPLETED SECONDARY SCHOOLING AND ABOVE» PER UNIT OF SECTOR OUTPUT (Lik/Xi)
AND SECTOR OUTPUT PER WORKER (Xi/Li)



completed secondary level. In view of the fact that our levels of education are cumulative, this points to a large stock of university-trained manpower combined with far from adequate numbers at secondary level.

Similar observations could be made for Egypt.

- On the other hand the relative positions of the other countries, which are roughly the same in both graphs, cannot be regarded as explained by substitutions of manpower with different levels of education.

A brief glance at Graphs C.12 and C.16 shows that the above observations also hold true for the commercial sector. It may be added that the most frequently observed values for Lik/Xi lie between 7 and 10 at university level, and between 40 and 60 at "completed secondary level or above".

Barring then a few rare exceptions, graphic analysis cannot explain by substitution effects the mediocre correlations noted between the sectoral educational coefficients and the economic indicators. In other words, few indeed are the countries "overeducated" at university level which are "undereducated" at secondary level, and vice versa.

On the other hand, the Lik/Xi (or Lik/Li) graphs have in many cases drawn attention to countries or groups of countries which are "overeducated" or "undereducated" at any level of education. Barring such exceptions as the Philippines and Egypt, there seems to be a proper balance between the different educational levels. These conclusions do no more than confirm those arrived at for the general educational coefficients Lk/X.

Before concluding, some reference to the tautological relationships (a), so far neglected, may be helpful. The addition of a third term (Li/L) on the right-hand side rules out any graphic demonstration.

Mathematically, on the basis of the following three equations:

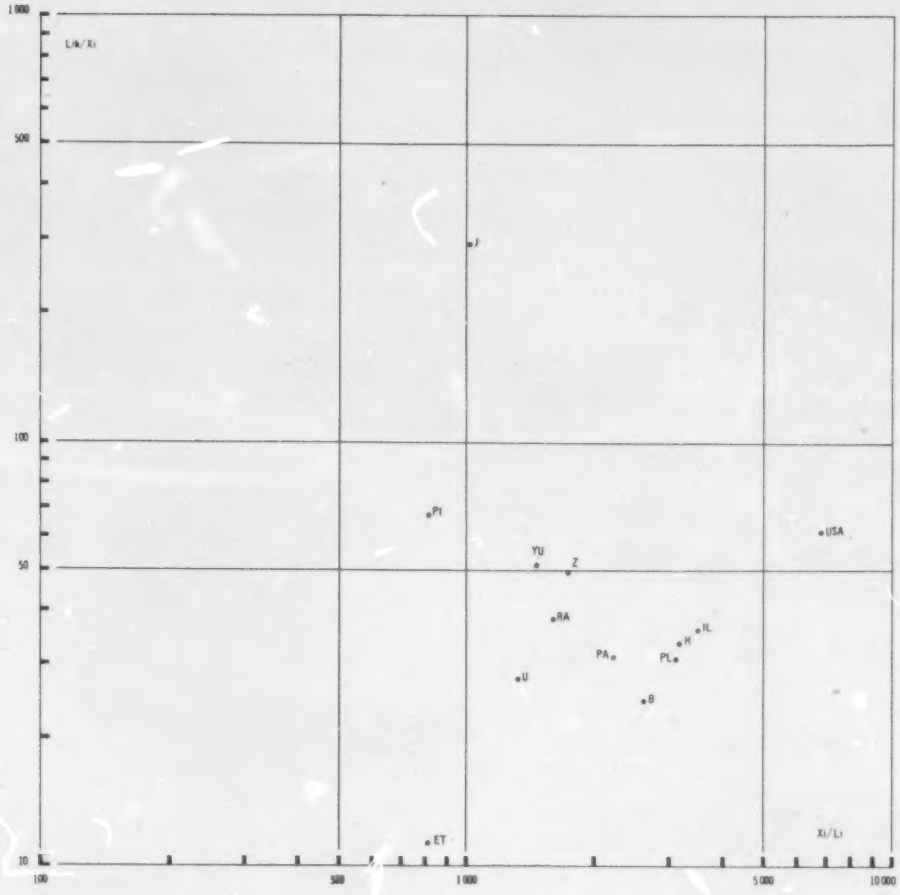
$$\log \text{Lik/Xi} = \log b_0 + b_1 \log \text{Xi/Li}$$

$$\log 100\ \text{Li/L} = \log c_0 + c_1 \log \text{Xi/Li}$$

$$\log 100\ \text{Lik/L} = \log d_0 + d_1 \log \text{Xi/Li}$$

Graph C-15

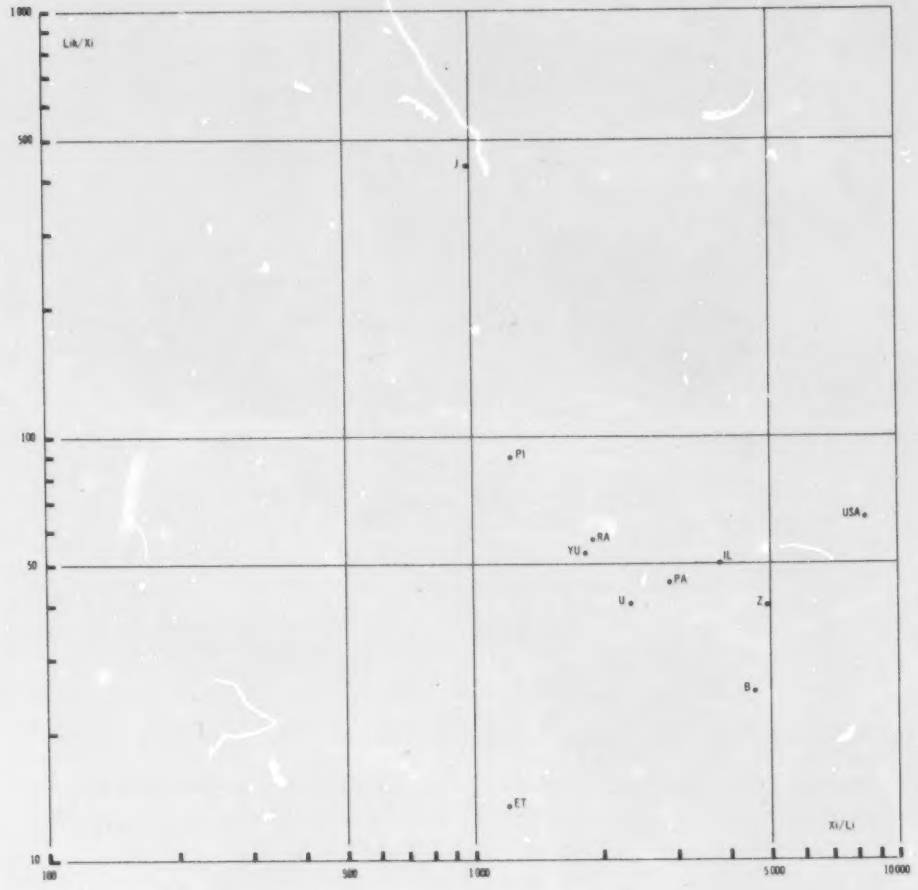
MANUFACTURING : PERSONNEL WITH «COMPLETED SECONDARY SCHOOLING AND ABOVE» PER UNIT OF SECTOR OUTPUT (Lik/Xi) AND SECTOR OUTPUT PER WORKER (Xi/Li)



P.78

Graph C-16

COMMERCE : PERSONNEL WITH «COMPLETED SECONDARY SCHOOLING AND ABOVE» PER UNIT OF SECTOR OUTPUT (Lik/Xi), AND SECTOR OUTPUT PER WORKER (Xi/Li)



we arrive at the following relationships:

(3) $\log b_o = \log d_o - \log c_o$

(4) $b_1 = d_1 - c_1 - 1$

By combining formulae (1) and (3), on the one hand, and (2) and (4) on the other, we obtain values for the parameters of the Lik/L equation most frequently used in this part of the study:

(5) $\log d_o = \log a_o + \log c_o - 2$

(6) $d_1 = a_1 + c_1$

Formulae (5) and (6) can easily be checked by Tables IV-1 and IV-2 which will be found in the First Volume, and by testing a few equations with Li/L as a dependent variable.

Annex D

FITTING PRODUCTION FUNCTIONS

1. INTRODUCTION

In the first volume attempts were made to fit a number of "demand functions" in which the economic indicators were regarded as explanatory variables. As was made clear in the First Part of this study, this type of function cannot easily be derived from the economic theory of production, and economists are often reduced to making rather unorthodox juxtapositions between the production and demand functions, with the usual warnings concerning inter-relationships*.

Unfortunately, we are not immune to this rule, and the present Annex will, therefore, be devoted to fitting a few production functions of the Cobb-Douglas type, a) first at the level of the economy as a whole and b) for the Manufacturing sector alone.

The originality of these functions resides, of course, in the breakdown of the labour input into different educational levels.

2. PRODUCTION FUNCTIONS FOR THE WHOLE ECONOMY

Some production functions tested in double-logarithmic form will be shown below; they are Cobb-Douglas functions in their most elementary form, of the type: $X = B. L^{\alpha}. C^{\beta}$.

The dependent variable will be the gross domestic product, measured in US dollars. The capital factor will be roughly represented

* See the introductory paragraph to Chapter VIII.

by the sum of gross fixed capital formation cumulated over the eight years preceding the census year. The labour input was broken down into two factors: Lk_A represents the numbers in the labour-force holding a University degree; $L-Lk_A$ represents all the rest of the labour-force.

By introducing the variables into the equation one after the other, the following results were obtained (with 22 observations):

(1) $\text{Log } X = -5.11 + \underset{(0.04)}{0.92} \log \Sigma I$ $\qquad R = 0.98$

(2) $\text{Log } X = -4.05 + \underset{(0.07)}{0.69} \log \Sigma I + \underset{(0.12)}{0.22} \log Lk_A$ $\qquad R = 0.99$

(3) $\text{Log } X = -4.47 + \underset{(0.07)}{0.68} \log \Sigma I + \underset{(0.09)}{0.16} \log Lk_A +$

$\underset{(0.11)}{0.13} \log (L-Lk_A)$ $\qquad R = 0.99$

To judge by the numerical value of the correlation coefficients, the fits are clearly excellent. The fact that the simple correlation between ΣI and X is already 0.98 foreshadows a high collinearity between explanatory variables. As always in such cases, precision of the regression coefficients falls off sharply as new variables are introduced, to the point where they are non longer usable. The (slight) improvement in correlation by no means makes up for this drawback.

To remedy it, equation (3) was retested by eliminating the "capital" factor, so as to isolate the influence of the two labour variables. The result obtained was as follows:

(4) $\text{Log } (X) = -0.69 + \underset{(0.14)}{0.66} \log Lk_A + \underset{(0.21)}{0.18} \log (L-Lk_A)$ $\qquad R = 0.92$

If these figures can be relied on, the "explained" amount of variance in X is here 86%, as against 96% with ΣI alone ...

The dilemma can be partly solved by taking as the explanatory variable "capital" per person employed: $\Sigma I/L$; this gives:

(5) $\text{Log } X = -4.47 + \underset{(0.07)}{0.68} \log (\Sigma I/L) + \underset{(0.09)}{0.17} \log Lk_A +$

$\underset{(0.12)}{0.80} \log (L-Lk_A)$ $\qquad R = 0.99$

The simple correlation between X and $\Sigma I/L$ being lower (R = 0.60) than that between X and ΣI (R = 0.98), the labour variables may then improve the relationship appreciably. If equations (3) and (5) are compared, only the regression coefficient of $(L-Lk_A)$ rises to the point where it becomes significant. The explanation is quite simple, inasmuch as Lk_A is relatively low, $(L\ Lk_A)$ is close to L, and it is as if we substituted in (3) and (5):

$$\log X = f(\Sigma I, L) \text{ and } \log X = f(\Sigma I/L, L).$$

We did not think it necessary to test other production functions by disaggregating the labour factor a little more, although it would be perfectly possible to isolate the numbers in the labour force with secondary level education (Lk_B), or with merely "more than eight years' schooling" (Lk_C). All these variables thus are closely correlated with X and, hence, with each other:

R	I	Lk_A	$L-Lk_A$	Lk_B	Lk_C	L	$\Sigma I/L$
X	0.98	0.92	0.87	0.95	0.96	0.85	0.60

The number of observations varies between 25 and 17.

One may say that the "scale effects" are largely responsible for the high collinearity observed between all these variables. Some equations were therefore computed using total employment (L) as a deflator for all variables. The following results were obtained:

$$\log (X/L) = 0.98 + \underset{(0.07)}{0.68} \log (\Sigma I/L) + \underset{(0.07)}{0.13} \log (Lk_A/L) \qquad R = 0.95$$

or with the educational level C (more than eight years of schooling):

$$\log (X/L) = 0.89 + \underset{(0.11)}{0.63} \log (\Sigma I/L) + \underset{(0.15)}{0.23} \log (Lk_C/L) \qquad R = 0.95$$

As can be observed, the precision of the regression coefficient on Lk_A is still very low in spite of the deflator. We shall see now whether the fitting of a production function on a sectoral level is somewhat less disappointing.

3. PRODUCTION FUNCTIONS FOR THE MANUFACTURING SECTOR

The dependent variable will be the output of the Manufacturing sector (Xi). As data are lacking on the stock of capital in this sector, this concept will be replaced by "per capita consumption of energy" (G), which in most countries is fairly representative of installed capacity.

The labour factor will be divided into two sub-variables; numbers in the sector with a university degree (Lik_A) and the remaining labour force ($L - Lik_A$).

This gives the following results, in double-logarithmic form, with 18 observations:

$$\log Xi = -2.92 + \underset{(0.08)}{0.25} \log Lik_A + \underset{(0.10)}{0.60} \log (L - Lik_A) + \underset{(0.05)}{0.52} \log G \qquad R = 0.99$$

As always in a function of this type, the fit is excellent but rather misleading; thus, the simple correlation coefficient between Lik and Xi is already 0.95, and the other two variables, therefore, do little to improve the fit*.

Only the simple correlation between Xi and G (R = 0.64) is appreciably improved by introducing one of the labour variables.

Bearing this in mind, the elasticities obtained are far more precise than those found with the same production function for the economy as a whole.

Similar results may be obtained if the two labour variables are changed; thus, Lik_C will here represent numbers in the sector with "more than eight years' schooling", and Lik_D those with "eight years' schooling or less". With 11 observations we then obtain:

$$\log Xi = -3.48 + \underset{(0.14)}{0.42} \log Lik_C + \underset{(0.15)}{0.52} \log Lik_D + \underset{(0.12)}{0.52} \log G \qquad R = 0.99$$

* (L-Lik) is also very closely correlated with Xi : R = 0.92.

In considering the correlation coefficient for the above equation, it must not be forgotten that the simple correlation between Xi and Lik_C is 0.98 ...

To eliminate "scale effects", a few equations were computed using total employment in the Manufacturing sector (Li) as a deflator. The following results were obtained:

$$\log (Xi/Li) = 1.75 + \underset{(0.07)}{0.50} \log G + \underset{(0.11)}{0.10} \log (Lik_A/Li) \qquad R = 0.92$$

and with Lik_B as the number of people working in the Manufacturing sector with "Complete secondary schooling and above":

$$\log (Xi/Li) = 1.92 + \underset{(0.12)}{0.43} \log G + \underset{(0.14)}{0.09} \log (Lik_B/Li) \qquad R = 0.85$$

and with Lik_C as the number of people working in the Manufacturing sector with "More than eight years of schooling":

$$\log (Xi/Li) = 1.54 + \underset{(0.12)}{0.47} \log G + \underset{(0.20)}{0.28} \log (Lik_C/Li) \qquad R = 0.95$$

These few examples seem to confirm the conclusions already formulated when fitting a production function for the economy as a whole with regards to the lack of precision of the regression coefficients on the labour factor. Without lapsing into complete scepticism, it must be concluded that disaggregation of the labour factor or, better still, its weighting for educational levels merely increases and adds to the collinearity phenomena. As a matter of fact, as long as one is not able to isolate labour inputs independent from each other and from the capital factor, to calculate the respective influences of any given factor on output seems to be more hazardous than useful. On the other hand, at the aggregate level, the problem of heterogeneity of output may be the source of many desillusions, and it would be useful to compute these equations again at the more disaggregate level of the economic branch. This kind of exercice is still impossible on an international base because of the lack of available data.

Annex E

A NOTE ON INFORMATION THEORY

1. The theory of information* concerns the degree of probability with which a given event may be expected to occur. Let us for example, consider the two following statements:

- the sun will rise tomorrow;
- the number of the winning ticket at the next draw of the National Lottery will be 626,357.

Uncertainty is practically nil as regards the first prediction but very high as regards the second. It may also be said that the first prediction tells us practically nothing: the information it transmits is almost nil. On the other hand, the second prediction affords us a considerable amount of information.

It may therefore be conceived that the probability of the occurrence (p) of a given event may be related to a value H (p) which expresses the degree of uncertainty of the prediction or the quantity of information it transmits. What must the characteristics of H (p) be?

Let us first assume that $p = 1$: the event is certain, the uncertainty is nil and $H(p) = 0$. If the probability decreases the uncertainty and the information increase and in the most extreme case it is reasonable to consider that $H(p) = \infty$ where $p = 0$.

Let us consider two independent events E_1 and E_2 with the respective probability of p_1 and p_2. Event (E_1 and E_2) has a probability of

* The word information is used here in a technical sense which is more precise than its everyday meaning. The information thus defined is linked to an a priori probability independent of whether or not the event actually occurs. In this context information and uncertainty are two modes of interchangeable interpretation of the theory.

$p_1\ p_2$. The combined uncertainties give us:

$$H\ (p_1\ p_2) = H\ (p_1) + H\ (p_2)$$

The preceding considerations make it logical to choose a logarithmic function

$$H\ (p) = \log \frac{1}{p} = -\log p$$

The minus sign is merely chosen to enable H (p) to be always positive. Normally logarithms on any base are suitable; quite often base 2 logarithms are chosen (and they will be used hereinafter) as they make it possible to define a unit for the measurement of the quantity of information which is known as the bit (= binary digit): 1 bit is the quantity of information transmitted by an event with the probability of 1/2 (this gives us $-\log_2 0.5 = 1$).

Let us now consider a set of n events $E_1/E_2/\ldots./E_n$ with respective probabilities of $p_1/p_2/\ldots\ p_n$. It is assumed that the events are independent and that one of them and only one of them must happen so that $p_1 + p_2 + \ldots. + p_n = 1$. The event E_i $(1 \leqslant i \leqslant n)$ transmits a quantity of information $-\log p_i$. As the event which is due to occur is not known a priori it may reasonably be agreed that information H of the series of E_i is a weighted average of $-\log p_i$, that is to say :

$$H = -p_1 \log p_1 - p_2 \log p_2 - \ldots. - p_n \log p_n - \sum_1^n p_i \log p_i.$$

This quantity is the entropy (or average uncertainty or average information). H is maximum when $p_1 = p_2 = \ldots. = p_n = 1/n$ and, in this case H max = log n. The maximum uncertainty does in fact exist when all the events are equiprobable and this maximum also depends on the number of the events: there is less uncertainty in the spin of a coin for example (n = 2; p = 1/2; H = 1 bit) than in a throw of the dice (n = 6; p = 1/6; H = log 6 = 2.585 bits).

With a given distribution of n possible events we therefore always have $0 \leqslant H \leqslant \log n$. The upper limit of H is therefore not fixed, which creates certain difficulties when comparing breakdowns which do not include the same number of classes.

2. It is proposed to use the preceding data first to make a brief study of the comparative value of the various possible groupings of educational levels.

The following table gives the breakdown by educational levels of the Canadian active population at the time of the 1961 census. The average entropy can be very rapidly calculated by simple addition, if the table of p log p is available: see below.

CLASSES	p_i	$p_i \log p_i$
1. Primary: under 5 years	0.062	0.2487
2. Primary: 5 and over	0.343	0.5294
3. Secondary: 1 or 2 years	0.225	0.4842
4. Secondary: 3 years	0.099	0.3303
5. Secondary: 4 or 5 years	0.183	0.4483
6. University: several years	0.045	0.2013
7. University: degree	0.043	0.1951
Total	1.000	2.4373

It will be noted that, in this breakdown, the maximum possible entropy is equal to log 7 = 2.807. The breakdown may be characterized by the coefficient of relative entropy R = H/H max = 2.437/2.807 = 87% (or by its complement to 1: C = 1 - R designated by redundancy).

Let us now suppose that the 7 classes are combined in 4 groups only, for example. This may be done in several ways. One possibility is the usual group of A, B, C, D*. The two others have been selected more or less arbitrarily, as an example.

The entropy for each breakdown is :

- First case: 1.177
- Second case: 1.536
- Third case: 1.736

* A is "University Degree", that is (7) in the preceding example;
B is "some years of University" or (6);
C is "complete secondary schooling, or (5);
D is "Less than complete secondary schooling", or (1+2+3+4)

	FIRST GROUPING	p	SECOND GROUPING	p	THIRD GROUPING	p
D	(1-2-3-4)	0.729	(1)	0.062	(1 and 2)	0.405
C	(5)	0.183	(2 and 3)	0.568	(3 and 4)	0.324
B	(6)	0.045	(4 and 5)	0.282	(5 and 6)	0.228
A	(7)	0.043	(6 and 7)	0.088	(7)	0.043
		1.000		1.000		1.000

It will be noted that in all cases the average information is slighter than that for the original breakdown. It is in fact shown that more aggregate breakdowns generally diminish entropy (intuitively this is fairly obvious). In the most favourable case, combination makes it equal to what it was previously. There is consequently always a loss of information although this greatly differs from one case to another.

However, an important detail must be added. The theory of information is mainly concerned with variables which have not been placed in ascending or descending order. If it is used for an ordered variable, as is the case here, the group which is optimum from the standpoint of the theory may be absurd as far as the continuum of the variable is concerned: for example the grouping 2; 3; 5 and 6; 1, 4 and 7 has an average entropy of 1.968 which is higher than the 3 previous groups.

3. Here is now a brief comparative analysis of the occupational structure of a number of countries. Only the ISCO major groups 0 to 9 have been retained. In Table E.1, the GNP (in dollars) for the year 1960 is shown (see the Tableaux de l'Economie Française, INSEE, 1963, p. 20). For all countries the maximum entropy of the breakdown is equal to log 9 = 3.170. The relative entropy is therefore 90% for Canada and 64% for Greece.

A first sight the table suggests the following comments:

a) Owing to the way entropies are computed there was a possible danger that countries with very different structures might have similar entropies. In actual fact, this is not generally the case (although the sample is much too limited for definite conclusions to be drawn).

TABLE E.1

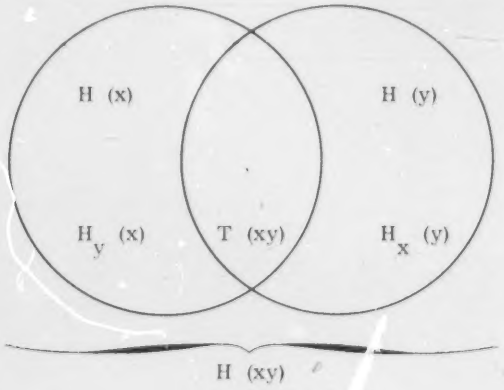
	CANADA 1961	USA 1960	NORWAY 1960	SWEDEN 1960	NETHER-LANDS 1960	FRANCE 1962	UNITED KINGDOM 1961	JAPAN 1960	PORTUGAL 1960	GREECE 1961
0	102	109	81	116	99	101	88	48	28	37
1	56	67	32	21	33	20	27	23	13	8
2	135	138	71	85	133	84	133	104	46	41
3	98	98	76	96	89	94	98	106	64	64
4	123	68	196	136	93	213	41	326	438	565
5	11	5	5	5	10	12	23	8	6	5
6	63	60	108	73	58	40	66	33	31	31
7/8	303	327	340	357	388	360	417	286	281	198
9	110	127	92	110	96	75	107	55	93	51
Total	1,001	999	1,001	999	999	999	1,000	999	1,000	1,000
Entropy	2.854	2.783	2.697	2.690	[illegible]	2.616	2.609	2.536	2.238	2.015
GNP/capita	2,021	2,796	[illegible]	[illegible]	978	1,276	1,347	417	261	384
Ranking Entropy	1	2	3	4	5	6	7	8	9	10
Ranking GNP	2	1	6	3	7	5	4	8	10	9

b) The rank correlation (spearman) between the entropy and the GNP per capital is very significant: the coefficient is significant to . 01 from 0. 746; here it is equal to 0. 830.

c) The percentages of group 4 and group 7/8 show a rather remarkable trend. For the first 5 countries the percentage of 7/8 increases regularly; subsequently France and Great Britain present an "anomaly", the first because of the high percentage of the group 7/8 (for these two countries, the practically identical entropy does not adequetely reflect their structural differences). The last three countries (contrary to the others) all have a bigger group 4 than group 7/8 but (contrary to the first five countries), the percentage of 7/8 diminishes instead of increasing.

4. The result of paragraph 3 is that the entropy here probably reflects complex phenomena. If this is expressed on a graph, the x-axis representing the entropy and the y-axis the GNP, the result is a scatter pattern which is very definitely parabolic with a minimum roughly representing Portugal.

5. Up to now the case of a single variable has been dealt with; an additional variable y (x being the first variable) will now be introduced. Generally speaking it is possible to represent the interaction of these variables by the following symbols:



The circles H (x) and H (y) represent each variable. If the two variables are linked, they have one section in common T (xy). Hy (x) and Hx (y) represent the specific feature of each variable not represented

in T (xy). H (xy) represents the total information existing in the system*; this is visibly:

$$T(xy) = H(x) + H(y) - H(xy).$$

As the variables x and y are still distributed by classes**, we have Table E.2.

TABLE E.2

	1	2	...	i	...	x	
1	p_{11}	p_{21}	...	p_{i1}	...	p_{x1}	$p_{.1}$
2	p_{12}	p_{22}	...	p_{i2}	...	p_{x2}	$p_{.2}$
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
j	p_{1j}	p_{2j}	...	p_{ij}	...	p_{xj}	$p_{.j}$
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
y	p_{1y}	p_{2y}	...	p_{iy}	...	p_{xy}	$p_{.y}$
	$p_{1.}$	$p_{2.}$	...	$p_{i.}$	...	$p_{x.}$	1

* The theory of information was initially developed by telecommunication specialists. The term message can therefore be used. H (x) is emitted by source x through a communication channel. It is picked up by a receiver y. If transmission is perfect H (x) = H (y) = T (xy). If there are "noise", part of the emitted information Hy (x) is lost (equivocation). Moreover, in the message H (y) picked up, the receiver includes its own "noise" interpretation Hx (y) (ambiguity). T (xy) represents the part of the message emitted which is properly received.

** It is possible to make an analysis with 3, 4 ... variables, by generalizing what follows. This point will be left aside.

The information transmitted T (xy) is then calculated as follows*:

$$H(x) = - \Sigma\, p_i \log p_i$$

$$H(y) = - \Sigma\, p_j \log p_j$$

$$H(xy) = - \Sigma\, p_{ij} \log p_{ij}$$

From this T (xy) can be immediately calculated. All this can again be done by simple addition if a table is available.

For the same reasons as outlined above, the T (xy) values for tables of different dimensions are not directly comparable. Is is possible to use the coefficient of constraint:

$$D(yx) = T(xy) / H(x)$$

which is the percentage of information transmitted. The theory of information does not however imply any causal relationship: x and y have a symmetrical role. There is consequently a second coefficient:

$$D(xy) = T(xy) / H(y)$$

which is not generally equal to the first for reasons which are intuitively clear from the diagram representing the intersecting circles.

6. If x is the educational level and y the occupational category, Table E. 3 shows the active population of the USA in 1960**; group X and apprentices have been eliminated.

The results are as follows:

$$H(a) = 1.740$$

$$H(y) = 2.783$$

$$H(xy) = 4.243$$

* It is possible to work directly on absolute figures instead of frequencies, but one is limited by the dimension of the available tables.

** x1 : Less than four years' secondary schooling;
x2 : Four years' secondary schooling;
x3 : One to three years' university;
x4 : Four years' university;
x5 : Five years' university or more;
The marginal frequencies are not necessarily equal to the sum of the internal frequencies as the figures have been rounded off.

TABLE E. 3

y \ x	x_1	x_2	x_3	x_4	x_5	TOTAL	H (y)
0	9	18	23	28	30	109	0. 3485
1	21	21	13	9	4	67	0. 2312
2	38	70	23	5	2	138	0. 3943
3	47	30	14	6	2	98	0. 3284
4	52	12	3	1	-	68	0. 2637
5	4	1	-	-	-	5	0. 0382
6	39	16	3	1	-	60	0. 2435
7/8	230	79	15	3	1	327	0. 5273
9	91	26	7	1	1	127	0. 3780
Total	532	274	101	54	39	1,000	2. 7831

T (xy) = 1. 740 + 2. 783 - 4. 243 = 0. 280

D (yx) = 0. 280/1. 740 = 16. 1%

D (xy) = 0. 280/2. 783 = 10. 1%

The value of T (xy) is not very high; a large part of the information is lost. One possible reason is that the educational level x is too aggregated.

7. These few examples seem to show the utility of the theory of information with respect to the optimal level of aggregation in cross-classifications.

TABLE OI

$p(i)$	·000	·001	·002	·003	·004	·005	·006	·007	·008	·009
·00	·0000	·0099	·0179	·0251	·0318	·0382	·0442	·0501	·0557	·0611
·01	·0664	·0715	·0765	·0814	·0862	·0908	·0954	·0999	·1043	·1086
·02	·1128	·1170	·1211	·1251	·1291	·1330	·1368	·1406	·1444	·1481
·03	·1517	·1553	·1589	·1624	·1658	·1692	·1726	·1759	·1792	·1825
·04	·1857	·1889	·1920	·1951	·1982	·2013	·2043	·2073	·2102	·2132
·05	·2160	·2189	·2217	·2246	·2273	·2301	·2328	·2355	·2382	·2409
·06	·2435	·2461	·2487	·2512	·2538	·2563	·2588	·2612	·2637	·2661
·07	·2685	·2709	·2733	·2756	·2779	·2802	·2825	·2848	·2870	·2892
·08	·2915	·2937	·2958	·2980	·3001	·3022	·3043	·3064	·3085	·3106
·09	·3126	·3146	·3166	·3186	·3206	·3226	·3245	·3264	·3284	·3303
·10	·3321	·3340	·3359	·3377	·3395	·3414	·3432	·3450	·3467	·3485
·11	·3502	·3520	·3537	·3554	·3571	·3588	·3605	·3621	·3638	·3654
·12	·3670	·3686	·3702	·3718	·3734	·3749	·3765	·3780	·3796	·3811
·13	·3826	·3841	·3856	·3870	·3885	·3900	·3914	·3928	·3943	·3957
·14	·3971	·3984	·3998	·4012	·4026	·4039	·4052	·4066	·4079	·4092
·15	·4105	·4118	·4131	·4143	·4156	·4168	·4181	·4193	·4205	·4218
·16	·4230	·4242	·4254	·4265	·4277	·4289	·4300	·4312	·4323	·4334
·17	·4345	·4356	·4367	·4378	·4389	·4400	·4411	·4421	·4432	·4442
·18	·4453	·4463	·4473	·4483	·4493	·4503	·4513	·4523	·4533	·4542
·19	·4552	·4561	·4571	·4580	·4589	·4598	·4608	·4617	·4626	·4635
·20	·4643	·4652	·4661	·4669	·4678	·4686	·4695	·4703	·4711	·4720
·21	·4728	·4736	·4744	·4752	·4760	·4767	·4775	·4783	·4790	·4798
·22	·4805	·4813	·4820	·4827	·4834	·4842	·4849	·4856	·4862	·4869
·23	·4876	·4883	·4890	·4896	·4903	·4909	·4916	·4922	·4928	·4935
·24	·4941	·4947	·4953	·4959	·4965	·4971	·4977	·4983	·4988	·4994
·25	·5000	·5005	·5011	·5016	·5021	·5027	·5032	·5037	·5042	·5047
·26	·5052	·5057	·5062	·5067	·5072	·5077	·5081	·5086	·5091	·5095
·27	·5100	·5104	·5109	·5113	·5117	·5121	·5126	·5130	·5134	·5138
·28	·5142	·5146	·5149	·5153	·5157	·5161	·5164	·5168	·5172	·5175
·29	·5179	·5182	·5185	·5189	·5192	·5195	·5198	·5201	·5204	·5207
·30	·5210	·5213	·5216	·5219	·5222	·5225	·5227	·5230	·5232	·5235
·31	·5237	·5240	·5242	·5245	·5247	·5249	·5251	·5254	·5256	·5258
·32	·5260	·5262	·5264	·5266	·5268	·5269	·5271	·5273	·5275	·5276
·33	·5278	·5279	·5281	·5282	·5284	·5285	·5286	·5288	·5289	·5290
·34	·5291	·5292	·5293	·5294	·5295	·5296	·5297	·5298	·5299	·5300
·35	·5301	·5301	·5302	·5302	·5303	·5304	·5304	·5305	·5305	·5305
·36	·5306	·5306	·5306	·5306	·5307	·5307	·5307	·5307	·5307	·5307
·37	·5307	·5307	·5307	·5306	·5306	·5306	·5306	·5305	·5305	·5304
·38	·5304	·5304	·5303	·5302	·5302	·5301	·5301	·5300	·5299	·5298
·39	·5297	·5297	·5296	·5295	·5294	·5293	·5292	·5291	·5290	·5288
·40	·5287	·5286	·5285	·5283	·5282	·5281	·5279	·5278	·5276	·5275
·41	·5273	·5272	·5270	·5268	·5267	·5265	·5263	·5262	·5260	·5258
·42	·5256	·5254	·5252	·5250	·5248	·5246	·5244	·5242	·5240	·5237
·43	·5235	·5233	·5231	·5228	·5226	·5223	·5221	·5219	·5216	·5214
·44	·5211	·5208	·5206	·5203	·5200	·5198	·5195	·5192	·5189	·5186
·45	·5184	·5181	·5178	·5175	·5172	·5169	·5165	·5162	·5159	·5156
·46	·5153	·5150	·5146	·5143	·5140	·5136	·5133	·5130	·5126	·5123
·47	·5119	·5116	·5112	·5108	·5105	·5101	·5097	·5094	·5090	·5086
·48	·5082	·5078	·5074	·5071	·5067	·5063	·5059	·5055	·5051	·5046
·49	·5042	·5038	·5034	·5030	·5026	·5021	·5017	·5013	·5008	·5004

From: *Information Transmission* by Elwyn Edwards, Chapman and Hall, London, 1964.

$-p(i)\log_2 p(i)$

$p(i)$	·000	·001	·002	·003	·004	·005	·006	·007	·008	·009
·50	·5000	·4995	·4991	·4986	·4982	·4977	·4972	·4684	·4963	·4948
·51	·4954	·4949	·4944	·4940	·4935	·4930	·4925	·4920	·4915	·4910
·52	·4905	·4900	·4895	·4890	·4885	·4880	·4875	·4870	·4864	·4859
·53	·4854	·4849	·4843	·4838	·4833	·4827	·4822	·4816	·4811	·4805
·54	·4800	·4794	·4789	·4783	·4778	·4772	·4766	·4761	·4755	·4749
·55	·4743	·4737	·4732	·4726	·4720	·4714	·4708	·4702	·4696	·4690
·56	·4684	·4678	·4672	·4666	·4659	·4653	·4647	·4641	·4635	·4628
·57	·4622	·4616	·4609	·4603	·4597	·4590	·4584	·4577	·4571	·4564
·58	·4558	·4551	·4544	·4538	·4531	·4524	·4518	·4511	·4504	·4497
·59	·4491	·4484	·4477	·4470	·4463	·4456	·4449	·4442	·4435	·4428
·60	·4421	·4414	·4407	·4400	·4393	·4386	·4379	·4371	·4364	·4357
·61	·4350	·4342	·4335	·4328	·4320	·4313	·4305	·4298	·4290	·4283
·62	·4275	·4268	·4260	·4253	·4245	·4237	·4230	·4222	·4214	·4207
·63	·4199	·4191	·4183	·4176	·4168	·4160	·4152	·4144	·4136	·4128
·64	·4120	·4112	·4104	·4096	·4088	·4080	·4072	·4064	·4056	·4047
·65	·4039	·4031	·4023	·4014	·4006	·3998	·3990	·3981	·3973	·3964
·66	·3956	·3948	·3939	·3931	·3922	·3914	·3905	·3896	·3888	·3879
·67	·3871	·3862	·3853	·3844	·3836	·3827	·3818	·3809	·3801	·3792
·68	·3783	·3774	·3765	·3756	·3747	·3738	·3729	·3720	·3711	·3702
·69	·3693	·3684	·3675	·3666	·3657	·3648	·3638	·3629	·3620	·3611
·70	·3602	·3592	·3583	·3574	·3564	·3555	·3545	·3536	·3527	·3517
·71	·3508	·3498	·3489	·3479	·3470	·3460	·3450	·3441	·3431	·3421
·72	·3412	·3402	·3392	·3383	·3373	·3363	·3353	·3344	·3334	·3324
·73	·3314	·3304	·3294	·3284	·3274	·3264	·3254	·3244	·3234	·3224
·74	·3214	·3204	·3194	·3184	·3174	·3163	·3153	·3143	·3133	·3123
·75	·3112	·3102	·3092	·3081	·3071	·3061	·3050	·3040	·3029	·3019
·76	·3009	·2998	·2988	·2977	·2967	·2956	·2945	·2935	·2924	·2914
·77	·2903	·2892	·2882	·2871	·2860	·2849	·2839	·2828	·2817	·2806
·78	·2795	·2785	·2774	·2763	·2752	·2741	·2730	·2719	·2708	·2697
·79	·2686	·2675	·2664	·2653	·2642	·2631	·2620	·2608	·2597	·2586
·80	·2575	·2564	·2552	·2541	·2530	·2519	·2507	·2496	·2485	·2473
·81	·2462	·2451	·2439	·2428	·2416	·2405	·2393	·2382	·2370	·2359
·82	·2347	·2336	·2324	·2312	·2301	·2289	·2277	·2266	·2254	·2242
·83	·2231	·2219	·2207	·2195	·2184	·2172	·2160	·2148	·2136	·2124
·84	·2112	·2101	·2089	·2077	·2065	·2053	·2041	·2029	·2017	·2005
·85	·1992	·1980	·1968	·1956	·1944	·1932	·1920	·1907	·1895	·1883
·86	·1871	·1859	·1846	·1834	·1822	·1809	·1797	·1785	·1772	·1760
·87	·1747	·1735	·1723	·1710	·1698	·1685	·1673	·1660	·1648	·1635
·88	·1622	·1610	·1597	·1585	·1572	·1559	·1547	·1534	·1521	·1509
·89	·1496	·1483	·1470	·1457	·1445	·1432	·1419	·1406	·1393	·1380
·90	·1368	·1355	·1342	·1329	·1316	·1303	·1290	·1277	·1264	·1251
·91	·1238	·1225	·1211	·1198	·1185	·1172	·1159	·1146	·1133	·1119
·92	·1106	·1093	·1080	·1066	·1053	·1040	·1027	·1013	·1000	·0987
·93	·0973	·0960	·0946	·0933	·0920	·0906	·0893	·0879	·0866	·0852
·94	·0839	·0825	·0812	·0798	·0784	·0771	·0757	·0743	·0730	·0716
·95	·0703	·0689	·0675	·0661	·0648	·0634	·0620	·0606	·0593	·0579
·96	·0565	·0551	·0537	·0523	·0509	·0496	·0482	·0468	·0454	·0440
·97	·0426	·0412	·0398	·0384	·0370	·0356	·0342	·0327	·0313	·0299
·98	·0285	·0271	·0257	·0243	·0228	·0214	·0200	·0186	·0172	·0157
·99	·0143	·0129	·0114	·0100	·0086	·0071	·0057	·0043	·0028	·0014

Annex F

BASIC DATA USED FOR THE OCCUPATIONAL ANALYSIS

Economic sectors are indicated by subscript i and occupational categories by subscript j.

In addition, each occupational category j is represented by means of its ISCO code :

Major Group 0 :	Professional, Technical and related workers	0
Major Group 1 :	Administrative, Executive and Managerial workers	1
Major Group 2 :	Clerical workers	2
Major Group 3 :	Sales workers	3
Minor Group 0-0 :	Architects, Engineers and Surveyors ..	0-0
Minor Group 0-1 :	Chemists, Physicists, Geologists and related	0-1
Minor Group 0-2 :	Biologists, Veterinarians, Agronomists	0-2
Minor Group 0-X :	Draughtsmen and Science and Engineering Technicians	0-X
Minor Groups 0-0/0-1/0-2/0-X:	Scientific and Technical Personnel ...	STP
Minor Group 1-1 :	Directors, Managers and Working Proprietors	1-1
Unit Group 0-0-2:	Engineers	0-02

For the nine Tables (one for the economy as a whole and eight for the main economic sectors) which are to be included in this Annex, the

occupational structure (in %) will be found in the left part and the economic indicators in the right part.

The data on the occupational structure are drawn from Statistics of the Occupational and Educational Structure of the Labour Force in 53 Countries, OECD, Paris, 1969.

Table F.1. WHOLE ECONOMY: OCCUPATIONAL STRUCTURE (L)/L) AND ECONOMID INDICATORS (n)

COUNTRY	L)/L (%)														n			
	0	1	0 + 1	2	3	0 + 1 + 2 + 3	0 - 0	0 - 1	0 - 2	0 + X	0 - 0 + 0 - X	STP	0 - 02	1 - 1	X/L (1)	l_e (2)	$\Sigma I/L$ (3)	E/P (4)
Belgium	8.32	2.70	11.02	11.79	11.39	34.20	0.70	0.05	0.06	1.13	1.83	1.94	0.50	1.21	3,179	68	3,377	3,853
Canada	9.72	6.27	15.99	12.89	8.40	37.28	-	-	-		-	-	-	-	4,930	87	7,920	5,606
Denmark	7.52	2.12	9.64	8.84	9.21	27.69	1.03	0.03	0.29	0.51	1.54	1.86	0.77	1.73	2,[illegible]	64	2,430	2,388
France	9.93	1.99	11.92	7.25	9.13	28.30	0.86	0.10	0.03	1.83	2.69	2.82	0.75	1.47	3,831	55	3,566	2 365
F.R. Germany	7.68	3.15	10.83	12.03	7.58	30.44	2.40	0.07	0.04	0.73	3.13	3.24	-	2.18	3,075	66	3,083	3,266
Great Britain	8.63	2.77	11.30	13.13	9.59	34.02	1.19	-	-	1.49	2.68	2.90	0.87	2.39	2,711	69	2,595	4,594
Greece	3.47	0.78	4.25	3.90	5.99	14.14	0.19	0.06	0.10	0.58	0.77	0.93	0.16	0.16	871	25	706	400
Ireland	7.33	1.17	8.50	7.35	9.64	25.49	-	-	-	-	-	-	-	-	1 603	38	1,570	1,338
Japan	4.89	2.33	7.22	10.43	10.56	28.21	-	-	-	-	-	-	-	-	831	32	1,143	985
Netherlands	9.12	3.14	12.26	12.36	9.44	30.06	-	-	-	-	-	-	-	-	2,461	58	3,261	2,675
Norway	8.05	3.16	11.21	7.01	7.52	25.74	0.78	0.07	0.16	1.11	1.89	2.12	0.64	2.67	2,923	60	5,441	2,477
Portugal	2.73	1.29	4.09	4.54	6.32	14.95	0.17	0.01	0.05	0.28	0.35	0.51	0.14	1.18	670	26	605	355
Sweden	9.22	2.13	11.35	8.46	9.51	29.32	-	0.16	0.12	-	2.61	2.99	-	-	3,501	81	4,199	2,995
United States 1950	8.35	8.68	17.03	11.12	7.40	35.55	1.01	-	-	0.39	1.40	1.62	0.92	8.30	5,100	75	-	-
United States 1960	10.76	8.32	19.08	13.31	7.72	40.11	1.44	0.18	0.06	0.86	2.30	2.54	1.33	7.90	6,985	100	7,280	7,834
Argentina	6.03	2.81	8.84	9.01	9.25	26.90	-	-	0.04	-	0.55	0.83	-	-	1,452	37	-	1,033
Chile	4.95	1.92	6.87	6.78	7.04	20.69	0.70	0.13	0.09	0.27	0.97	1.19	-	1.77	1,815	28	658	787
Costa Rica	5.22	1.30	6.52	5.23	7.57	19.32	-	-	-	-	-	-	-	-	1,200	25	1,402	226
Ecuador	3.26	0.33	3.59	3.33	5.99	12.91	-	-	-	-	-	-	-	-	566	20	544	157
Egypt	3.15	1.10	4.26	3.68	8.10	16.02	0.25	0.02	0.09	0.21	-	0.57	0.21	1.06	605	16	-	235
El Salvador	2.89	0.26	3.15	2.53	5.16	10.84	-	-	0.03	-	0.[illegible]	0.25	-	0.21	575	16	-	119
Finland	8.20	1.64	9.84	5.17	6.91	21.92	-	0.04	0.35	-	2.52	2.91	-	1.39	2,164	43	3,208	1,404
Ghana	2.34	0.52	2.86	1.69	13.50	18.05	0.10	-	-	0.36	0.46	0.51	-	0.32	513	15	-	87
Honduras	2.52	0.59	3.11	2.22	3.95	9.28	-	-	0.03	-	0.10	0.23	-	0.33	644	14	538	142
Hong-Kong	4.74	3.10	7.84	6.07	13.66	27.57	0.32	0.06	0.02	0.51	0.83	0.91	-	2.89	783	20	-	509
Hungary	7.05	1.35	8.40	6.40	4.26	19.06	0.47	0.10	0.26	1.86	2.33	2.69	0.38	0.53	1,333	36	-	2,180
Israël	12.08	4.17	16.25	11.93	7.95	36.13	-	-	-	-	1.70	2.06	-	3.90	3,640	47	4,380	1,122
Jamaica	3.05	2.62	5.67	4.35	7.12	17.14	0.05	0.01	0.01	0.11	0.16	0.18	-	2.49	992	27	1,095	549
Korea (S)	2.36	1.28	3.64	2.60	8.21	14.45	0.18	0.01	-	-	-	-	-	1.15	461	9	271	214
Mexico	3.62	0.84	4.46	6.12	9.[illegible]	19.62	-	-	-	-	-	-	-	-	763	23	-	817
Pakistan	1.40	0.40	1.80	1.80	4.30	7.90	0.05	0.001	0.001	0.22	0.27	0.27	0.02	-	253	12	-	56
Panama	5.87	2.41	8.28	4.54	5.46	18.28	-	-	0.05	-	0.45	0.74	0.15	1.76	1,281	23	1,046	478
Peru	3.66	1.38	5.04	3.73	7.42	16.19	-	-	-	-	-	-	-	-	726	18	-	315
Philippines	2.54	0.61	3.55	2.26	6.12	11.93	0.19	-	-	0.06	0.25	0.36	-	0.38	662	16	-	149
Poland	6.55	-	-	-	-	-	0.78	0.06	0.20	2.71	3.47	3.73	0.70	-	1,640	37	2,005	3,518
Puerto Rico	7.86	10.59	18.45	7.79	6.75	32.59	-	-	-	-	-	-	-	-	3,076	34	3,262	1,210
Rumania	6.05	1.40	7.45	2.55	1.44	11.44	0.28	0.02	0.09	1.36	1.64	1.75	0.28	-	1,071	30	-	1,100
Sierra Leone	1.22	0.26	1.48	0.77	5.20	7.45	-	-	-	-	-	-	-	-	278	10	-	59
South Africa	2.81	1.43	4.24	4.01	2.77	11.02	-	-	-	-	-	-	-	-	1,782	36	574	2,496
Syria	2.33	0.67	3.00	3.24	8.57	14.81	-	0.01	0.02	-	0.10	0.13	-	0.44	670	18	-	286
Uruguay	6.08	1.46	7.54	12.45	9.85	29.84	0.42	-	0.13	0.26	0.68	1.08	-	1.38	1,267	35	1,242	800
USSR	8.77	1.94	10.71	4.43	2.12	17.26	0.87	0.20	0.50	1.30	2.17	2.87	-	-	1,740	43	2,474	2,787
Zambia	2.40	0.46	2.86	1.45	0.52	4.83	0.23	0.03	0.04	0.18	0.41	0.48	0.19	-	834	18	-	558

(1) Output per worker in U.S. dollars.
(2) "Economic" non monetary index : U.S. = 100.
(3) Gross capital formation per worker in U.S. dollars.
(4) Energy consumption per capita in kwh.

Table F.2. AGRICULTURE - OCCUPATIONAL STRUCTURE (L_{ij}/L_i) AND ECONOMIC INDICATORS (n_{ij})

COUNTRY	L_{ij}/L_i (%)								n_{ij}			
	0	1	0 + 1	2	0 + 2	0 + X	0 + 2 + 0 + X	STP	X_i/L_i (1)	$\Sigma I/L_i$ (2)	F/L_i (3)	T/L_i (4)
Belgium	0.23	0.09	0.32	0.26	0.15	0.03	0.18	0.23	3,190	1,995	781	72
Canada	0.72	0.73	1.45	0.56	-	-	-	-	2,480	4,525	260	-
Denmark	1.23	-	1.23	0.08	1.20	0.02	1.22	1.23	2,300	1,630	637	120
France	0.18	0.08	0.26	0.16	0.04	0.02	0.06	0.11	1,720	1,385	290	61
F.R. Germany	0.30	0.04	0.34	0.16	0.04	0.24	0.28	0.28	1,250	1,440	491	140
Great Britain	0.37	0.19	0.56	1.52	0.09	0.16	0.25	0.27	2,650	2,370	772	350
Greece	0.16	-	0.16	-	0.11	0.03	0.14	0.14	490	140	70	7
Ireland	0.11	-	-	0.07	-	-	-	-	1,090	750	182	59
Japan	0.04	0.06	0.10	0.30	-	-	-	-	350		87	1
Netherlands	0.15	0.22	0.37	0.48	-	-	-	-	2,410	1,280	655	54
Norway	0.13	0.06	0.19	0.07	0.12	-	0.12	0.12	1,600	2,625	334	91
Portugal	0.09	0.07	0.16	0.08	0.07	0.01	0.08	0.08	400	165	87	3
Sweden	0.76	0.11	0.87	0.52	0.60	-	0.60	0.71	2,220	1,400	465	200
Turkey	0.04	-	-	-	0.01	-	0.01	0.03	220	-	3	4
United States 1950	0.37	0.28	0.65	0.26	0.17	0.03	0.20	0.24	2,710	-	-	-
United States 1960	0.73	0.52	1.25	0.66	0.34	0.12	0.46	0.50	4,790	5,520	815	612
Argentina	0.11	0.17	0.28	0.29	-	-	0.02	0.06	1,330	-	8	28
Chile	0.20	0.12	0.32	0.46	-	-	0.16	0.19	680	-	67	-
Costa Rica	0.18	0.13	0.31	0.40	-	-	-	-	790	-	-	-
Ecuador	0.07	-	-	-	-	-	-	-	380	-	4	2
Egypt	0.07	0.01	0.08	0.19	0.04	0.02	0.06	0.07	340	-	54	3
El Salvador	0.07	-	-	0.20	-	-	0.05	0.06	360	-	-	-
Finland	0.44	0.02	0.46	0.11	0.42	-	0.42	0.43	1,210	1,160	180	46
Ghana	0.42	0.08	0.50	0.26	-	0.39	0.39	-	-	-	-	-
Honduras	0.16	0.04	0.20	0.30	-	-	-	-	440	-	13	-
Hong-Kong												
Hungary	0.73	0.31	1.04	1.12	0.42	0.05	0.47	0.57	730	-	36	12
Israël	0.67	1.80	3.30	4.40	0.06	-	0.06	0.18	1,910	5,545	412	40
Jamaica	0.07	0.51	0.58	0.60	0.01	0.01	0.02	0.02	310	410	27	-
Korea (S)	0.02	0.04	0.06	0.13	-	-	-	-	280	50	-	-
Mexico	0.28	-	-	0.42	-	-	-	-	260	-	36	9
Pakistan	-	-	-	-	-	-	-	-	-	-	-	-
Panama	0.31	0.06	0.37	0.29	-	-	0.03	0.08	620	-	-	-
Peru	0.14	0.01	0.15	0.20	-	-	-	-	320	-	44	2
Philippines	0.05	0.04	0.09	0.07	-	-	-	0.02	340	-	12	1
Poland	0.34	-	-	-	0.11	0.21	0.32	0.33	630	500	-	-
Puerto Rico	0.25	-	-	0.48	-	-	0.02	0.02	1,460	-	-	-
Rumania	0.57	0.09	0.66	0.22	0.07	0.33	0.40	0.41	-	-	-	-
Sierra Leone	0.06	0.01	0.07	0.02	-	-	-	-	130	-	-	-
South Africa	0.09	0.04	0.13	0.08	-	-	-	-	470	-	1	59
Syria	0.01	-	-	0.03	-	-	-	-	390	-	-	-
Uruguay	0.28	0.17	0.45	0.33	-	-	-	-	1,020	-	-	-
USSR	1.22	-	-	2.21	1.01	0.10	1.11	1.17	820	850	-	-
Zambia												

(1) Sector Output per worker in U.S. dollars.
(2) Gross capital formation per worker in U.S. dollars.
(3) Fertilizer consumption in kg per worker.
(4) Number of tractors per 1,000 workers.

Table F.3. MINING: OCCUPATIONAL STRUCTURE (L_{ij}/L_i) AND ECONOMIC INDICATORS (a_i)

COUNTRY	L_{ij}/L_i (%)											a_i		
	0	1	0 + 1	2	3	0 + 1 + 2 + 3	0 - 0	0 - 1	0 - X	STP	0 - 02	X_i/L_i (1)	$\Sigma I/L_i$ (2)	X_i/X (3)
Belgium	1.87	0.91	2.78	4.67	0.07	7.52	1.14	0.03	0.51	1.68	0.92	2,543	3,170	2.9
Canada	7.97	3.55	11.52	6.65	0.48	18.65	-	-	-	-	-	11,380	22,530	4.2
Denmark	0.33	2.17	2.50	2.50	0.19	5.19	0.30	0.001	0.003	0.30	0.27	2,269	-	0.1
France	3.91	0.87	4.78	3.02	0.26	8.06	1.25	0.19	1.15	2.59	0.96	4,520	6,350	2.2
F.R. Germany	6.01	0.48	6.49	4.32	0.18	10.99	5.13	0.07	0.50	5.70	4.97	3,641	4,818	3.1
Great Britain	1.84	1.36	3.20	4.45	0.001	7.65	0.98	0.07	0.50	1.55	0.94	2,655	2,571	2.8
Greece	2.11	0.34	2.45	3.64	6.68	12.77	0.58	0.18	0.18	0.94	0.54	1,886	1,311	1.2
Ireland	1.87	0.28	2.15	2.72	0.001	4.87	-	-	-	-	-	2,317	1,833	-
Japan	2.12	1.56	3.68	8.48	0.46	12.62	-	-	-	-	-	1,057	-	1.8
Netherlands	7.39	0.79	8.18	5.96	0.07	14.21	-	-	-	-	-	3,286	-	1.9
Norway	3.79	3.55	7.34	3.04	0.03	10.41	1.36	0.07	2.13	3.56	1.34	4,6[illegible]	7,163	1.0
Portugal	1.31	1.12	2.43	1.85	0.09	5.37	0.52	0.03	0.47	1.02	0.39	572	1,417	0.7
Sweden	4.65	1.58	6.23	4.61	0.39	-	-	0.24	-	4.20	-	8,660	7,670	1.8
Turkey														
United States 1950	3.52	3.95	7.47	4.43	0.26	12.16	1.48	0.84	0.44	2.76	1.30	9.048	-	1.5
United States 1960	7.23	5.80	13.03	7.27	0.43	20.73	2.38	2.02	1.26	5.66	2.19	15.448	11,127	1.4
Argentina	2.47	1.76	4.23	5.06	0.63	9.92	-	0.28	-	1.53	-	2.628	-	1.1
Chile	2.40	1.97	4.37	6.91	0.07	11.35	1.97	0.18	0.02	2.18	-	3.014	-	6.9
Costa Rica	1.60	1.69	3.29	2.07	0.94	6.30	-	-	-	-	-	-	-	-
Ecuador	3.78	1.92	5.70	6.23	0.001	11.93		-	-	-	-	5.415	-	2.4
Egypt	4.04	1.15	5.19	4.75	0.26	10.20	1.44	0.39	1.16	2.99	1.39	7.230	-	3.6
El Salvador	1.07	0.13	1.20	0.40	0.001	1.60	-	-	-	1.07	-	4.260	-	0.4
Finland	10.53	1.61	12.14	5.37	0.60	18.11	-	0.60	-	10.00	-	4.606	5,070	0.7
Ghana	1.73	0.49	2.22	3.57	1.50	7.29	0.89	-	0.21	1.10	-	1.510	-	-
Honduras	1.53	2.37	3.90	2.60	0.001	6.50	-	-	-	-	-	2.600	-	1.0
Hong-Kong	2.52	3.28	5.80	4.67	5.74	16.21	0.39	0.15	0.87	1.49	-	-	-	-
Hungary	3.41	0.39	3.80	4.41	0.001	8.21	0.93	0.18	1.95	3.06	0.72	2,652	-	-
Israël	6.72	7.90	14.62	9.67	0.35	24.64	-	1.30	-	5.78	-	3,395	-	-
Jamaica	4.52	6.17	10.69	8.21	0.07	18.97	-	0.18	1.05	2.64	-	13,061	23,300	8.9
Korea (S)	1.45	2.47	3.92	4.79	0.14	8.85	-	-	-	-	-	1,570	1,176	1.9
Mexico	8.33	1.23	9.56	10.76	1.49	21.81	-	-	-	-	-	1,510	-	2.1
Pakistan	1.44	1.21	2.65	4.99	0.10	7.74	-	-	-	-	-	870	-	0.3
Panama	3.89	1.39	5.28	2.50	0.001	7.78	-	1.11	-	2.22	0.28	3,055	-	2.8
Peru	3.35	4.82	8.17	6.03	0.47	14.77	-	-	-	-	-	2,938	-	8.6
Philippines	5.55	0.76	6.31	4.70	0.34	11.35	1.27	0.38	0.25	1.90	-	3,727	-	1.6
Poland														
Puerto Rico	0.29	4.86	5.15	1.71	0.29	7.15	-	0.29	-	0.29	0.01	2,500	-	0.2
Rumania														
Sierra Leone	0.73	0.14	0.87	0.99	0.09	1.95	-	-	-	-	-	-	-	-
South Africa	0.58	0.17	0.75	1.64	0.01	2.40	-	-	-	-	-	1,550	-	13.7
Syria	0.15	1.11	1.26	0.80	0.05	2.11	-	0.03	-	0.06	-	-	-	-
Uruguay	4.17	4.17	8.34	4.17	0.001	12.51	-	-	-	-	-	-	-	-
USSR														
Zambia	4.97	0.20	5.17	2.03	0.01	7.21	2.25	0.31	0.30	2.87	2.00	6,316	-	50.0

(1) Sector output per worker in U.S. dollars.
(2) Gross Capital formation per worker in U.S. dollars.
(3) Sector share in GDP (%).

Table F.4. MANUFACTURING: OCCUPATIONAL STRUCTURE (Li)/Li - %) AND ECONOMIC INDICATORS (a_i)

COUNTRY	Li)/Li (%)												a_i		
	0	1	0 + 1	2	3	0 + 1 + 2 + 3	0 - 0	0 - 1	0 - X	0 + 0 - 0 - X	STP	0 - 02	Xi/Li (1)	Σi/Li (2)	Li/L (3)
Belgium	3.02	2.87	5.89	9.51	1.21	12.61	0.80	0.07	1.76	2.56	2.64	0.79	2,591	2,050	36.0
Canada	5.19	6.73	11.92	12.22	3.94	28.08	-	-	-	-	-	-	5,537	5,863	22.7
Denmark	2.63	1.81	4.44	6.45	3.17	14.06	1.30	0.01	0.89	2.13	2.18	1.20	2,919	1,268	28.5
France	7.26	2.47	9.73	5.86	3.75	19.34	1.26	0.26	2.35	4.61	4.87	1.23	4,963	-	28.6
F.R. Germany	5.14	2.16	7.30	10.44	2.40	20.14	3.36	0.13	1.12	4.48	4.62	-	3,370	-	38.0
Great Britain	5.44	3.60	9.04	10.99	2.11	22.43	1.49	-	2.66	4.15	4.49	1.47	2,637	1,808	36.0
Greece	1.55	1.22	2.77	3.84	8.50	15.11	0.11	0.22	0.59	0.70	0.93	0.11	1,178	575	13.1
Ireland	1.67	3.02	4.69	8.25	2.86	15.80	-	-	-	-	-	-	2,493	1,374	17.0
Japan	1.78	4.03	5.81	10.94	3.05	19.80	-	-	-	-	-	-	1,017	-	21.7
Netherlands	4.35	3.62	7.97	10.84	1.96	20.77	-	-	-	-	-	-	2,597	-	29.9
Norway	3.95	4.53	8.48	5.74	0.86	15.08	0.96	0.08	2.05	3.01	3.11	0.95	3,048	-	25.5
Portugal	0.79	2.50	3.29	3.67	0.69	7.65	0.19	0.02	0.44	0.63	0.65	0.19	1,005	2,347	20.9
Sweden	5.22	2.64	7.82	8.44	4.01	20.27	-	0.28	-	3.89	4.19	-	3,387	-	34.2
Turkey	1.21	-	-	-	-	-	-	0.13	-	-	0.74	-	827	-	-
United States 1950	4.80	4.77	9.57	10.75	2.97	23.29	1.63	-	0.85	2.48	2.88	1.62	6,566	-	25.9
United States 1960	7.44	5.08	12.52	11.63	3.77	27.92	2.71	0.36	1.90	4.61	4.99	2.70	7,227	5,935	27.1
Argentina	1.36	3.26	4.62	6.00	1.45	12.07	-	0.30	-	0.57	0.90	-	1,603	-	28.0
Chile	1.36	2.84	4.20	5.51	0.48	10.19	0.96	0.16	0.02	0.98	1.16	-	1,777	-	18.0
Costa Rica	1.21	2.07	3.28	3.43	2.94	9.65	-	-	-	-	-	-	-	-	11.5
Ecuador	0.17	0.48	0.65	1.20	0.22	2.07	-	-	-	-	-	-	594	-	14.6
Egypt	1.24	1.22	2.46	3.93	0.73	7.12	0.36	0.06	0.32	0.68	0.76	0.36	845	-	9.1
El Salvador	0.85	0.42	1.27	0.99	0.13	2.39	-	0.49	-	0.63	0.56	-	425	-	12.8
Finland	6.49	2.32	8.81	6.02	1.64	16.47	-	0.03	-	-	5.62	-	2,691	2,700	21.5
Ghana	0.16	0.21	0.37	0.97	0.71	2.05	0.06	-	0.02	0.08	0.08	-	-	-	9.1
Honduras	0.42	1.10	1.52	2.21	1.52	5.25	-	-	-	-	-	-	1,079	-	7.8
Hong-Kong	1.08	3.11	4.19	3.66	13.18	21.03	0.05	0.06	0.40	0.45	0.52	-	-	-	39.7
Hungary	7.15	0.84	7.99	7.16	0.19	15.34	0.69	0.30	-	-	5.82	0.66	1,002	-	23.8
Israel	3.20	5.95	9.15	7.01	2.06	18.22	-	-	-	1.80	2.03	-	4,030	-	23.2
Jamaica	0.41	3.44	3.85	2.11	0.28	6.24	0.02	0.01	0.02	0.04	0.05	-	922	1,396	14.8
Korea (S)	0.93	6.57	7.50	3.63	1.05	12.18	-	-	-	-	-	-	680	696	6.8
Mexico	3.02	1.70	4.72	6.99	3.37	15.08	-	-	-	-	-	-	1,365	-	13.7
Pakistan	0.26	0.98	1.24	1.76	0.16	3.16	-	-	-	-	-	-	285	-	8.2
Panama	3.09	3.23	6.32	3.99	1.85	10.16	-	0.51	-	0.79	1.34	-	2,216	-	7.4
Peru	1.19	2.15	3.34	2.98	1.18	7.50	-	-	0.11	0.37	0.50	-	1,045	-	13.2
Philippines	0.94	0.99	1.93	2.90	0.70	5.53	0.26	-	-	-	-	-	1,075	-	10.5
Poland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puerto Rico	2.14	3.94	6.08	5.42	2.74	14.24	-	-	-	-	-	-	3,822	-	17.1
Rumania	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sierra Leone	0.27	0.22	0.49	0.91	0.31	1.71	-	-	-	-	-	-	408	-	4.5
South Africa	2.10	2.75	4.85	5.23	2.30	12.38	-	-	-	-	-	-	2,925	-	14.2
Syria	0.21	0.99	1.20	2.14	0.54	3.88	-	0.01	-	0.08	0.10	-	-	-	12.0
Uruguay	1.61	1.94	2.13	7.53	3.98	13.64	-	-	-	-	-	-	-	-	21.2
USSR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zambia	0.90	2.00	2.90	5.41	1.84	10.15	0.14	0.02	0.	0.32	0.34	0.14	1,256	-	11.5

(1) Sector Output per worker in U.S. dollars.
(2) Gross Capital Formation per worker in U.S. dollars.
(3) Sectoral structure of employment (in %).

Table F.5. CONSTRUCTION: OCCUPATIONAL STRUCTURE (Lij/Li) AND ECONOMIC INDICATORS (n_i)

COUNTRY	Lij/Li (%)								n_i		
	0	1	0 + 1	2	0 - 0	0 - X		0 - 02	Xi/Li (1)	D/Li (2)	Ce/P (3)
Belgium	1.01	3.88	4.89	2.31	0.43	0.53	0.96	0.30	4,680	26	487
Canada	2.28	8.31	10.59	3.27	-	-	-	-	3,739	25	297
Denmark	1.19	0.08	1.27	1.53	1.11	0.07	1.18	0.81	2,920	18	314
France	7.03	0.89	7.99	2.77	1.69	4.08	5.79	0.76	5,211	26	319
F.R. Germany	2.42	1.10	3.52	3.57	2.29	0.19	5.92	2.20	4,521	27	470
Great Britain	3.18	3.79	6.97	5.24	2.02	0.81	2.84	0.95	2,560	18	271
Greece	9.22	0.08	9.30	2.55	2.63	6.56	9.19	2.03	1,098	29	206
Irland	1.91	0.53	2.44	2.51	-	-	-	-	1,610	12	248
Japan	2.12	2.17	4.29	6.92	-	-	-	-	7,080	15	242
Netherlands	1.46	5.66	7.12	3.02	-	-	-	-	1,733	25	164
Norway	1.92	1.32	3.24	1.76	0.82	1.07	1.89	0.78	2,199	21	320
Portugal	0.85	1.40	2.25	1.03	0.41	0.41	0.82	0.33	589	12	138
Sweden	5.21	1.07	6.23	3.01	-	-	5.10	-	3,840	23	401
Turkey	2.84	-	-	-	-	-	2.70	-	1,077	-	73
United States 1950	3.77	8.32	12.09	3.13	2.55	0.38	2.96	2.26	5,415	-	-
United States 1960	4.65	9.78	14.43	4.34	2.80	0.58	3.40	2.41	5,998	33	313
Argentina	2.64	1.81	4.45	1.92	2.42	-	2.48	-	1,056	-	132
Chile	2.72	2.29	5.01	2.18	2.67	0.01	2.70	-	843	27	119
Costa Rica	2.01	1.44	3.45	4.85	-	-	-	-	768	13	-
Ecuador	3.47	1.04	4.51	0.75	-	-	-	-	645	-	38
Egypt	1.74	4.22	5.96	1.53	1.24	0.33	1.57	0.69	1,217	-	82
El Salvador	1.63	0.12	1.75	1.53	1.55	-	-	-	545	2	33
Finland	7.32	0.73	8.05	2.97	-	-	7.30	6.90	2,355	17	278
Ghana	2.02	3.27	5.29	4.63	0.78	0.97	1.75	-	906	-	-
Honduras	2.69	1.04	3.73	3.00	-	-	-	-	954	-	6
Hong-Kong	5.38	2.51	7.89	3.74	2.49	2.46	4.99	-	-	-	58
Hungary	7.47	0.53	8.00	5.87	2.23	3.78	6.08	1.32	2,262	19	157
Israël	3.60	7.03	10.63	5.84	-	-	3.33	-	2,902	44	403
Jamaica	0.32	2.59	2.91	1.08	0.09	0.17	0.26	-	1,448	-	118
Korea (S)	2.00	2.55	4.55	3.55	-	-	-	-	995	12	15
Mexico	4.47	1.90	6.37	2.44	-	-	-	-	738	-	88
Pakistan	1.40	3.42	4.82	1.02	-	-	-	-	577	-	12
Panama	4.15	5.96	10.11	2.07	-	-	3.42	1.58	2,448	15	97
Peru	2.29	2.09	4.38	1.14	-	-	-	-	629	-	54
Philippines	1.59	1.00	2.59	0.93	1.17	0.11	1.46	-	960	-	30
Poland	12.27	-	-	-	3.96	7.29	11.52	3.36	2,590	18	182
Puerto Rico	4.27	4.18	8.45	3.55	-	-	-	1.77	2,446	31	397
Rumania	11.02	3.36	14.38	5.40	1.86	5.11	6.99	1.84	-	29	120
Sierra Leone	1.43	1.94	3.37	3.96	-	-	-	-	652	-	-
South Africa	1.37	2.26	3.63	1.49	-	-	-	-	-	6	162
Syria	0.22	1.08	1.30	0.33	-	-	0.45	-	633	16	107
Uruguay	0.61	3.27	3.88	1.64	-	-	-	-	1,149	-	138
USSR	4.75	1.28	6.03	2.97	2.41	1.70	4.16	-	2,096	39	184
Zambia	0.72	0.60	1.32	1.63	0.49	0.16	0.65	0.31	642	-	34

(1) Sector Output per worker in U.S. dollars.
(2) Output of dwellings per 100 workers.
(3) Cement Production per capital (in kg).

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Table F.6. ELECTRICITY, GAS AND WATER: OCCUPATIONAL STRUCTURE (L_{ij}/L_i) AND ECONOMIC INDICATORS (n_j)

COUNTRY	L_{ij}/L_i (%)											n_j			
	0	1	0 + 1	2	3	4 + 0 + 1 + 2 + 5	0 - 0	0 - 1	0 - X	STP	0 - 02	X_i/L_i (1)	$\Sigma I/L_i$ (2)	E_p/L_i (3)	E/P (4)
Belgium	6.76	3.22	9.98	25.68	0.32	35.98	2.80	0.05	3.51	6.37	2.67	7,231	23,020	746	3,853
Canada	9.92	5.81	15.73	20.38	1.55	37.66	-	-	-	-	-	15,488	69,758	1,204	5,606
Denmark	6.35	2.58	8.93	10.44	0.34	19.71	3.70	-	-	6.34	3.39	8,171	19,270	59	2,388
France	19.92	2.80	22.72	20.49	1.31	44.52	5.73	0.50	8.28	14.51	5.54	7,260	39,840	426	2,365
F.R. Germany	9.30	2.21	11.51	22.36	0.45	34.32	7.54	0.05	1.46	9.05	7.42	8,261	22,181	929	3,266
Great Britain	6.09	3.41	9.50	18.24	3.36	31.10	3.35	0.38	1.86	5.59	3.25	4,917	18,715	504	4,594
Greece	9.24	0.49	9.73	19.03	0.32	29.08	3.51	0.05	4.81	8.42	3.40	2,526	10,731	43	400
Ireland	6.26	0.64	6.90	17.25	0.47	24.62	-	-	-	-	-	4,667	16,627	228	1,338
Japan	5.36	2.70	8.06	41.34	0.30	49.70	-	-	-	-	-	6,400	-	260	965
Netherlands	7.38	1.47	8.85	22.66	0.35	31.86	-	-	-	-	-	5,075	-	335	2,675
Norway	9.12	4.90	14.02	13.05	0.02	27.09	3.26	0.01	5.55	8.84	3.21	9,440	51,584	334	2,477
Portugal	6.35	1.10	7.45	23.32	1.05	31.82	2.60	0.03	2.96	5.59	2.31	3,809	15,857	63	355
Sweden	11.89	2.42	14.31	10.15	0.42	24.88	-	0.20	-	11.47	-	9,948	45,520	119	2,995
Turkey															
United States 1950	7.54	5.16	12.70	18.84	0.14	31.68	4.09	0.19	0.90	-	3.88	6,037	-	-	-
United States 1960	7.84	5.49	13.33	19.13	1.07	33.53	3.69	0.21	1.60	5.50	3.44	12,700	40,132	1,523	7,534
Argentina	2.82	2.22	5.04	20.04	0.45	25.53	-	-	-	2.22	-	1,699	-	176	1,033
Chile	6.69	1.33	8.02	19.16	0.13	27.31	6.28	0.10	0.06	6.45	-	1,643	-	211	787
Costa Rica	4.17	1.38	5.55	17.01	0.21	22.77	-	-	-	-	-	-	-	16	226
Ecuador	2.12	0.35	2.47	11.80	0.04	14.31	-	-	-	-	-	2,417	-	11	157
Egypt	3.35	0.92	4.27	9.24	0.02	13.53	1.40	0.01	1.11	2.53	1.20	1,092	-	120	235
El Salvador	3.50	0.12	3.62	12.41	0.12	16.15	-	-	-	1.22	-	2,913	-	18	119
Finland	12.19	1.85	14.04	9.81	0.27	24.12	-	0.08	-	11.99	-	6,786	33,670	35	1,404
Ghana	4.62	0.63	5.25	7.46	0.28	12.99	1.21	-	0.36	1.57	-	848	-	47	87
Honduras	2.70	3.60	6.30	16.31	0.01	22.61	-	-	-	-	-	2,888	-	41	142
Hong-Kong	3.71	1.81	5.52	6.15	3.07	14.74	1.07	0.03	1.57	2.69	-	-	-	86	509
Hungary	7.93	0.95	8.88	9.01	0.15	18.04	1.27	0.15	5.86	7.15	1.16	2,000	-	261	2,180
Israël	6.35	5.00	12.17	19.06	0.46	31.69	-	0.04	-	5.50	-	3,498	-	13	1,122
Jamaica	1.23	3.86	5.09	9.36	0.03	14.48	0.41	0.03	0.44	0.88	-	2,055	8,500	4	549
Korea (S)	1.82	2.96	4.78	30.03	14.83	49.64	-	-	-	-	-	1,626	9,974	352	214
Mexico	8.58	1.93	10.51	31.07	2.83	44.41	-	-	-	-	-	3,589	-	787	817
Pakistan	1.40	3.42	4.82	1.02	0.02	5.86	-	-	-	-	-	563	-	72	56
Panama	5.73	5.00	10.73	17.47	0.01	28.20	-	-	-	2.80	-	5,600	-	20	478
Peru	3.00	5.47	8.47	12.75	0.65	22.87	-	-	-	-	-	1,021	-	581	315
Philippines	6.03	3.13	9.16	30.62	0.55	40.33	3.29	0.16	0.70	4.15	-	842	-	24	149
Poland															
Puerto Rico	6.43	2.73	9.16	18.03	0.60	27.79	-	-	-	-	-	4,881	-	3	1,210
Rumania															
Sierra Leone	4.85	0.62	5.47	7.84	2.45	15.76	-	-	-	-	-	-	-	1	59
South Africa	2.74	0.08	2.82	2.94	0.73	6.49	-	-	-	-	-	4,230	-	794	2,496
Syria	0.91	0.60	1.51	19.70	0.03	21.24	-	0.01	-	0.52	-	-	-	2	286
Uruguay	2.83	0.57	3.40	42.38	0.01	45.78	-	-	-	-	-	1,503	-	6	800
USSR															
Zambia	3.68	0.28	3.96	2.55	0.12	6.63	0.49	0.01	2.79	3.28	0.43				

(1) Sector Output per worker in U.S. dollars.
(2) Gross capital formation per worker in U.S. dollars.
(3) Energy production per worker in kwh.
(4) Energy consumption per capita in kwh.

Table F.7. TRANSPORT AND COMMUNICATIONS: OCCUPATIONAL STRUCTURE (L_i/L_t) AND ECONOMIC INDICATORS (n_j)

COUNTRY	L_i/L_t (%)									n_j			S/X
	0	1	0 + 1	2	3	* 0 + 1 2 + 3	6	STP	0 + 02	X1/Li (1)	C/Li (2)	T/Li (3)	(4)
Belgium	1.69	1.84	3.53	20.43	0.32	24.28	46.1	1.23	0.32	3,099	181.0	1,205	148.76
Canada	3.43	6.07	9.50	19.13	0.79	29.42	41.5	-	-	5,891	1,150.0	5,719	70.45
Denmark	0.85	0.43	1.28	11.18	0.65	13.11	66.3	0.83	0.48	3,947	169.8	1,132	167.98
France	5.32	2.70	8.02	11.05	3.03	22.70	36.9	3.42	1.49	4,635	1,823.1	4,978	79.61
F.R. Germany	3.68	4.60	8.28	16.84	0.31	25.43	49.8	3.58	-	3,468	783.5	6,509	143.60
Great Britain	1.34	2.09	3.43	15.10	0.69	19.22	55.4	1.03	0.33	3,322	1,576.7	8,544	166.77
Greece	1.05	1.67	2.72	4.15	0.05	6.92	60.5	0.78	0.22	1,527	370.0	267	396.20
Ireland	0.74	1.13	1.87	17.10	2.70	21.67	56.1	-	-	-	46.1	181	-
Japan	1.45	3.69	5.14	26.52	0.76	32.42	40.1	-	-	-	1,382.7	6,345	-
Netherlands	1.51	2.26	3.77	16.63	0.56	20.96	51.7	-	-	3,276	1,725.0	1,740	157.81
Norway	1.06	1.84	2.90	5.75	0.31	8.96	71.6	0.89	0.33	4,377	113.4	773	163.58
Portugal	1.17	1.71	2.88	10.97	0.44	14.29	62.0	0.81	0.28	1,006	50.4	427	616.30
Sweden	2.91	1.74	4.65	9.62	0.30	14.57	65.3	2.47	-	4,110	115.3	2,761	158.89
Turkey													
United States 1950	1.88	5.57	7.45	17.85	0.35	25.65	40.7	0.90	0.69	5,362	7,734.6	38,205	75.90
United States 1960	3.15	6.48	9.63	20.69	0.81	31.13	40.4	1.51	1.06	7,149	12,217.6	77,422	56.51
Argentina	0.96	1.96	2.92	16.25	0.39	19.56	47.6	0.59	-	1,495	389.7	1,360	318.39
Chile	1.09	2.35	3.44	19.73	0.51	23.68	45.1	0.93	-	2,500	68.8	203	180.40
Costa Rica	0.41	3.49	3.90	23.27	0.73	27.90	41.1	-	-	1,200	97.0	20	342.50
Ecuador	0.39	0.40	0.79	19.34	0.50	20.63	61.5	-	-	804	20.4	38	764.93
Egypt	1.85	1.91	3.76	8.10	0.22	12.08	57.2	1.34	0.74	1,401	19.5	245	408.28
El Salvador	0.56	1.85	2.41	5.60	0.07	8.04	69.6	0.06	-	1,089	9.8	18	639.12
Finland	1.63	1.14	2.77	5.17	0.20	8.14	73.8	1.43	1.39	2,530	72.6	654	291.70
Ghana	0.58	1.36	1.94	8.05	0.25	10.24	54.2	0.49	-	-	17.7	26	-
Honduras	0.18	2.32	2.50	27.83	2.36	32.69	44.1	-	-	2,520	5.3	6	175.00
Hong-Kong	0.92	1.78	2.70	6.19	1.68	10.57	55.1	0.58	-	-	10.8	129	-
Hungary	3.25	0.48	3.71	9.25	0.38	13.34	52.4	2.39	0.37	833	31.3	343	629.05
Israël	1.95	4.77	6.72	16.70	1.35	24.77	45.5	1.49	-	4,374	25.7	134	104.02
Jamaica	0.44	7.02	7.46	11.83	0.23	19.52	21.5	0.12	-	2,414	9.3	38	10.06
Korea (S)	0.86	3.81	4.67	9.53	0.81	15.01	58.0	-	-	1,034	18.6	122	560.93
Mexico	1.83	0.97	2.80	17.71	1.00	21.51	77.0	-	-	1,171	315.0	567	657.56
Pakistan	0.51	1.18	1.69	10.22	0.12	12.03	73.8	-	-	954	30.9	90	773.58
Panama	1.70	3.01	4.71	7.47	0.09	12.57	68.0	0.62	0.11	2,450	7.6	33	277.55
Peru	1.85	2.49	4.34	10.87	0.27	15.48	-	-	-	1,368	65.2	113	-
Philippines	0.69	1.00	1.69	4.25	0.15	6.09	69.5	1.22	-	-	75.2	128	-
Poland	5.45	-	-	-	-	-	-	5.04	0.50	1,133	173.5	1,193	-
Puerto Rico	3.72	4.30	8.02	11.57	1.05	20.64	-	-	0.23	3,895	36.9	109	-
Rumania	10.34	3.23	13.57	5.54	0.10	19.21	55.2	7.04	0.57	-	6.9	-	-
Sierra Leone	1.83	1.16	2.99	7.09	0.20	10.28	62.4	-	-	674	4.2	-	925.82
South Africa	1.22	2.15	3.37	14.76	0.12	18.25	35.0	-	-	2,649	233.0	970	132.13
Syria	0.28	1.12	1.40	7.75	0.43	9.58	73.5	0.12	-	1,973	12.3	58	372.53
Uruguay	0.81	1.79	2.50	29.11	0.81	32.52	36.8	-	-	1,753	82.2	137	209.93
USSR	3.46	1.77	5.13	6.91	0.61	12.75	57.1	2.72	-	1,278	-	-	446.79
Zambia	1.28	1.14	2.42	7.87	0.29	10.58	-	0.94	0.22	2,497	11.4	-	-

(1) Sector Output per worker in U.S. dollars.
(2) Number of commercial vehicles per worker.
(3) Number of telefones per worker.
(4) Number of Transport Men per unit of sector output.

Table F.8. COMMERCE: OCCUPATIONAL STRUCTURE (Lij/Li) AND ECONOMIC INDICATORS (n_i)

COUNTRY	Lij/Li (%)					n_i			
	0	1	0 + 1	2	3	Xi/Li (1)	X/P (2)	Σi/Li (3)	Li/L (4)
Belgium	2.16	3.74	5.90	20.37	57.19	4,630	1,200	8,316	15.4
Canada	2.52	9.66	2.18	24.48	40.00	6,800	1,800	10,470	17.8
Denmark	0.55	3.33	3.88	20.23	56.06	4,260	1,256	-	14.9
France	4.10	3.60	7.70	12.81	48.35	4,860	1,320	-	15.5
F.R. Germany	1.87	2.94	4.81	25.40	46.61	4,249	1,232	5,040	13.9
Great Britain	2.05	0.82	2.87	13.94	56.08	3,118	1,244	5,300	13.7
Greece	3.63	0.90	4.53	12.49	82.24	2,415	373	3,230	7.2
Ireland	1.39	2.26	3.65	14.33	59.23	-	583	2,400	15.0
Japan	0.59	3.89	4.48	15.72	54.73	983	347	-	17.6
Netherlands	2.01	4.86	6.87	22.51	53.25	2,763	890	5,080	16.3
Norway	2.38	6.17	8.55	19.86	54.39	4,057	1,330	8,900	13.3
Portugal	1.08	1.68	2.76	16.57	72.58	1,081	250	1,930	8.2
Sweden	2.27	3.32	5.59	18.02	58.02	5,515	1,509	10,430	13.5
Turkey	1.79	-	-	-	71.70	2,380	191	-	3.1
United States 1950	2.40	22.15	24.55	15.87	28.82	7,774	1,735	-	21.9
United States 1960	2.45	18.75	21.20	19.42	28.40	8,603	2,570	16,100	22.4
Argentina	1.24	3.09	4.33	14.58	69.25	2,564	513	-	15.3
Chile	0.82	3.04	3.86	15.80	67.78	4,854	588	-	10.1
Costa Rica	1.36	3.39	4.75	14.14	69.44	-	336	-	9.8
Ecuador	0.50	0.70	1.20	9.93	87.15	1,761	186	-	6.7
Egypt	0.77	1.20	1.97	5.81	87.31	1,219	137	-	9.0
El Salvador	2.00	0.86	4.05	11.26	79.40	2,183	198	-	6.4
Finland	3.16	5.12	8.28	16.82	55.06	3,468	982	8,900	11.6
Ghana	0.11	0.75	0.86	2.86	91.28	-	185	-	14.5
Honduras	0.76	1.85	2.61	11.32	77.98	2,980	188	-	4.8
Hong-Kong	0.38	8.28	8.66	19.60	59.62	-	199	-	11.2
Hungary	4.21	2.22	6.43	24.61	32.10	1,390	662	-	6.6
Israël	2.24	6.25	8.49	23.27	55.92	-	1,071	-	11.9
Jamaica	0.45	7.72	8.17	10.90	70.75	2,460	419	-	9.9
Korea (S)	0.32	0.74	1.06	2.82	92.50	1,052	130	696	8.3
Mexico	2.08	2.37	4.47	9.63	81.52	2,522	275	-	9.5
Pakistan	0.16	3.87	4.03	3.28	87.52	948	56	-	4.9
Panama	4.74	8.70	13.44	14.43	53.24	2,787	363	-	9.2
Peru	1.81	3.83	5.64	11.06	77.51	1,676	194	-	9.0
Philippines	1.57	1.48	3.05	4.16	88.73	2,163	153	-	6.4
Poland	9.30	-	-	-	-	2,160	948	-	5.8
Puerto Rico	2.68	27.59	30.27	13.77	37.74	6,402	761	-	13.8
Rumania	17.48	5.30	22.78	13.82	40.19	-	643	-	-
Sierra Leone	0.18	0.67	0.85	2.84	87.87	-	83	-	5.9
South Africa	2.01	6.21	8.22	13.65	28.33	3,831	450	-	8.3
Syria	0.37	0.47	0.84	4.26	93.83	1,179	164	-	8.8
Uruguay	1.06	2.58	3.64	22.06	60.88	2,341	526	-	13.3
USSR	3.09	7.80	10.89	12.29	30.36	-	790	-	5.1
Zambia	1.35	4.21	5.56	14.22	13.78	2,717	187	-	3.1

(1) Sector Output per worker in U.S. dollars.
(2) GDP per worker in U.S. dollars.
(3) Gross capital formation per worker in U.S. dollars.
(4) Sector share of employment (in %).

Table F.9. SERVICES: OCCUPATIONAL STRUCTURE (L_{ij}/L_i) AND ECONOMIC INDICATORS (n_i)

COUNTRY	L_{ij}/L_i (%)														n_i		
	0	1	0 + 1	2	3	0 + 1 + 2 + 3	0 - 0	0 - 1	0 - 2	0 - X	STP	0 - 0 + 0 - X	0 - 02	1 - 1	X/P (1)	I_s (2)	L_i/L (3)
Belgium	29.40	2.74	32.14	14.28	9.53	55.95	1.16	0.09	0.17	1.05	2.47	2.21	0.39	0.42	1,200	70	22.29
Canada	26.96	6.27	33.23	13.03	0.76	47.02	-	-	-	-	-	-	-	-	1,800	76	26.98
Denmark	28.20	4.85	33.05	10.01	1.09	44.15	2.02	0.09	0.31	0.93	3.35	2.95	1.16	3.13	1,256	77	22.12
France	30.37	2.40	32.77	12.93	1.16	46.86	0.87	0.06	0.12	1.05	1.31	1.93	0.77	0.57	1,320	66	20.15
F.R. Germany	26.86	8.61	35.47	16.82	0.87	53.16	2.88	0.12	0.20	1.19	4.39	4.07	-	4.35	1,232	76	17.98
Great Britain	21.44	2.63	24.07	19.18	3.72	46.98	1.42	-	-	1.32	3.07	2.74	0.30	1.63	1,244	78	27.53
Greece	26.33	1.36	27.69	13.44	12.45	53.58	0.28	0.14	0.19	1.08	1.69	1.36	0.21	-	373	42	12.10
Ireland	34.44	1.09	35.53	13.15	0.77	49.45	-	-	-	-	-	-	-	-	583	54	19.08
Japan	27.74	2.65	30.39	20.86	1.36	52.61	-	-	-	-	-	-	-	-	347	31	14.88
Netherlands	29.98	2.17	32.15	15.14	0.48	47.77	-	-	-	-	-	-	-	-	890	70	23.50
Norway	34.08	4.14	38.22	10.31	0.16	48.69	1.75	0.24	0.68	1.49	4.16	3.24	1.02	1.61	1,330	70	18.44
Portugal	15.56	2.81	18.37	11.48	1.47	31.32	0.48	0.05	0.14	0.71	1.38	1.19	0.32	2.22	250	30	15.03
Sweden	32.73	2.57	35.30	9.52	0.95	45.77	-	0.31	0.15	-	4.51	4.05	-	-	1,509	79	19.83
Turkey	24.20	-	-	-	1.19	42.80	-	0.31	0.50	-	1.98	1.17	-	-	191	16	5.70
United States 1950	27.48	6.76	34.24	13.40	0.95	48.59	1.12	-	-	0.45	1.89	1.57	0.87	5.12	1,735	-	21.77
United States 1960	29.81	6.17	35.98	15.18	0.83	51.99	1.35	0.23	0.11	0.89	2.58	2.24	1.04	4.55	2,570	100	25.04
Argentina	17.30	3.71	21.01	13.84	1.38	36.23	-	-	0.08	-	0.95	0.64	-	-	529	50	15.27
Chile	18.25	2.99	21.24	8.89	0.27	30.40	0.68	0.23	0.13	1.16	2.20	1.84	-	2.38	588	42	22.79
Costa Rica	27.12	2.43	29.55	10.61	1.97	42.13	-	-	-	-	-	-	-	-	336	32	17.22
Ecuador	22.74	0.90	23.64	11.95	0.53	36.12	-	-	-	-	-	-	-	-	186	20	13.19
Egypt	15.03	3.69	18.72	11.47	0.52	30.71	10.71	0.05	0.36	0.63	1.75	1.34	0.59	0.53	137	14	17.30
El Salvador	18.56	0.76	19.32	9.50	0.29	29.11	-	-	0.01	-	-	-	-	0.37	198	15	13.07
Finland	36.34	2.58	38.92	7.83	0.74	47.49	-	0.17	1.17	-	3.86	2.52	-	0.95	982	72	14.83
Ghana	31.71	3.04	34.75	9.07	1.53	45.35	0.33	-	-	1.25	1.57	1.57	-	0.62	185	13	6.02
Honduras	18.58	2.62	5.36	6.65	0.56	2.57	-	-	-	-	-	-	-	-	188	12	12.22
Hong-Kong	16.24	2.16	18.40	6.79	5.28	30.47	0.21	0.15	0.04	0.36	0.70	0.51	-	1.57	199	-	22.49
Hungary	37.02	7.84	44.86	11.91	0.26	57.03	0.63	0.17	0.68	1.49	2.97	2.12	0.51	0.07	662	50	10.21
Israël	33.90	5.22	39.12	16.58	2.23	57.93	-	-	-	-	3.19	2.29	-	1.70	1,071	67	30.54
Jamaica	12.95	2.91	15.86	9.30	0.16	25.32	0.09	0.02	0.04	0.34	0.49	0.43	-	2.31	419	24	21.88
Korea (S)	16.35	4.42	20.77	12.39	2.59	35.75	-	-	-	-	-	-	-	-	130	20	13.35
Mexico	18.37	1.83	20.20	21.66	3.68	45.54	-	-	-	-	-	-	-	-	275	25	13.47
Pakistan	16.16	1.29	17.45	15.59	0.31	33.35	-	-	-	-	-	-	-	-	56	8	8.17
Panama	19.37	4.19	23.56	9.46	1.37	34.39	-	-	0.10	-	1.32	0.71	0.19	1.58	363	33	24.92
Peru	19.50	2.61	22.11	8.08	1.40	31.59	-	-	-	-	-	-	-	-	194	22	15.27
Philippines	22.63	2.74	25.37	10.99	0.42	36.78	0.88	-	-	0.37	1.52	1.25	-	0.94	153	19	11.46
Poland																	
Puerto Rico	23.32	7.89	31.21	13.01	2.04	46.26	-	-	-	-	-	-	0.48	-	761	-	27.29
Rumania	47.35	9.49	56.84	14.37	0.62	71.83	1.53	0.27	0.45	3.13	5.38	4.66	1.46	-	643	41	-
Sierra Leone	33.02	4.56	37.58	8.52	0.31	46.41	-	-	-	-	-	-	-	-	83	3	3.15
South Africa	16.35	1.86	18.21	8.16	0.53	26.90	-	-	-	-	-	-	-	-	450	24	12.47
Syria	16.93	2.98	19.91	15.39	0.51	35.81	-	0.02	0.12	-	0.65	0.51	-	1.47	199	14	13.14
Uruguay	18.98	1.21	20.19	16.83	2.44	39.46	-	-	-	-	-	-	-	-	526	57	28.00
USSR	44.75	4.60	49.35	7.67	0.57	57.59	1.95	1.30	0.31	3.64	7.20	5.89	-	-	790	52	13.92
Zambia	20.09	1.97	22.06	4.71	0.18	26.95	0.33	0.05	0.38	1.27	2.03	1.60	0.20	0.20	187	-	9.90

(1) GDP per capita in U.S. dollars.
(2) "Social" non monetary index : U.S. = 100.
(3) Sectoral structure of employment (in %).

Annex G

BASIC DATA USED FOR THE OCCUPATIONAL ANALYSIS

Occupational categories are indicated by subscript j and educational levels by subscript k.

a) Each occupational category j is also represented by a figure:

Major Group 0	:	Professional, Technical and related workers	0
Minor Groups 0-0/0-1/ 0-2/0-X	:	Scientific and Technical Personnel (STP)	9
Minor Group 0-X	:	Draughtsmen and Science and Engineering Technicians	8
Major Group 1	:	Administrative, Executive and Managerial Workers	1
Major Group 2	:	Clerical workers	2
Major Group 3	:	Sales workers	3
Major Group 4	:	Farmers, Fishermens and related	4
Major Group 5 to 9	:	All manual categories but Farmers	5
Major Group 7/8	:	Craftsmen, Production - Process workers	7

b) Each educational level k is also represented by a letter:

University Degree and above	A
Complete Secondary schooling and above	B
More than eight years of schooling	C

Eight years of schooling or less ..... D

Mean years of schooling ..... E

The data on the educational levels (profiles) of the occupational categories are drawn from Statistics of the Occupational and Educational Structure of the Labour Force in 53 Countries, OECD, Paris, 1969.

NOTE: The subscript for the occupational category is always shown before the educational subscript. Thus for example, Ljk/L in column 9B represents the number of people in occupational category 9 (Scientific and Technical Personnel) with educational level B (Complete Secondary schooling and above) as a proportion of total employment. Thus for the Netherlands, the proportion in total employment of Scientific and Technical Personnel with complete Secondary schooling and above is 1.48% (Table G.5).

Table G. 1. BASIC STATISTICAL DATA

COUNTRY	X: GDP (10^6 US DOLLARS)	L: TOTAL EMPLOYMENT (1000 PERSONS)	X/L: LABOUR PRODUCTIVITY (US DOLLARS)	I_e: NON MONETARY INDEX USA = 100	$\Sigma I/L$: GFCF(a) PER EMPLOYED WORKER (US DOLLARS)	E/X: PERCENTAGE OF EXPORTS IN GDP	X/P: GDP PER CAPITA (US DOLLARS)
Canada	32,035	6,471.9	4,950	87	7,520	19.8	1,800
United States	457,233	68,007.0	6,720	100	6,920	4.7	2,570
France	61,530	18,813.0	3,270	55	3,600	13.8	1,320
Greece	3,160	3,663.1	860	25	706	10.0	370
Japan	36,291	43,690.5	830	32	1,143	12.6	350
Norway	4,112	1,406.4	2,920	60	5,441	41.5	1,330
Netherlands	10,262	4,168.6	2,460	58	3,304	50.0	1,040
Portugal	2,206	3,315.6	670	26	605	18.1	250
Sweden	11,044	3,244.1	3,400	81	4,200	26.8	1,510
Yugoslavia	4,748	8,340.4	570	21	784	12.0	260
Argentina	10,600	7,895.7	1,340	37	-	10.0	510
Chile	4,335	2,388.7	1,810	28	658	11.5	590
Korea (S)	2,868	7,027.9	410	9	271	5.8	130
Egypt	3,583	6,890.6	520	16	-	14.0	180
Ecuador	811	1,450.0	560	20	544	18.0	190
Ghana	1,313	2,559.4	510	17	481	26.0	185
Honduras	366	567.9	640	14	538	19.8	190
Hong-Kong	930	1,103.6	840	20	-	-	200
Hungary	6,500	4,876.2	1,330	36	708	14.0	650
Israël	2,584	709.9	3,640	43	4,520	17.0	1,070
Pakistan	7,580	29,954.2	250	12	-	5.3	60
Panama	391	299.4	1,310	23	1,046	31.2	360
Peru	2,166	3,120.8	690	18	-	25.3	190
Philippines	3,625	9,395.0	410	15	187	19.5	150
Puerto Rico	2,800	782.0	3,580	34	4,145	45.1	760
Syria	620	1,044.4	590	18	645	17.7	150
Uruguay	1,344	995.5	1,350	35	1,242	12.6	530
Zambia	851	805.9	1,060	19	945	76.0	230

a) Gross fixed capital formation.

Data for each country are those of the reference year: see Table A. 1.

SOURCES AND NOTES:

- X : The data are drawn from the Yearbook of National Account Statistics, United Nations, 1963: Part C. Country tables and Part D. International tables (Principal aggregates and their relationships).
  a) X is GDP at factor costs for the reference year indicated in Table A. 1. When data on GDP at factors are not available, the most similar aggregate was taken (for example GDP at market prices for Ghana). In eastern countries, Net Material Product (NMP) does not include Services activities and is therefore not immediately comparable to GDP. Estimates for the latter exist for Yugoslavia: see the OECD series "Economic survey"; for Hungary separate estimates were made.
  b) For the conversion into U. S. dollars, the exchange rates of the IMF were used: see International Financial Statistics, April 1967.
- L : is drawn from the Occupation/Education matrices of the "Statistics of the Occupational and Educational Structure of the Labour Force in 53 Countries, OECD, Paris 1969 (Tables II).
- I_e : is Niewiarowsky's "economic" non monetary index. See "The Level of Living of Nations: Meaning of Measurement" by D. H. Niewiarowsky in Estadistica Journal of the Inter-American Statistical Institute, March 1965.
- $\Sigma I/L$: represents the gross fixed capital formation per worker cumulated over a period of servers to eight years preceding the census year. Data are drawn from the Yearbook of National Account Statistics 1962 to 1966, Country tables. For the conversion into U. S. dollars, current exchange rates were used.
- E/X : represents the proportion of exports of goods and services in the expenditure on GDP for the census year, or for the two or three years preceding it: whenever this was not a "normal" year with respect to business activity: see Yearbook of National Account Statistics, Country tables.
- X/P : Estimates of per capita gross domestic product expressed in U. S. dollars.

Table G. 2. OCCUPATIONAL STRUCTURE (Lj/L) AND EDUCATIONAL STRUCTURE (Lk/L) OF THE TOTAL LABOUR FORCE

COUNTRY	Lj/L									Lk/L			
	0	9	8	1	2	3	4	5	7	A	B	C	D
Canada	9.73	2.04	0.93	5.35	12.89	9.32	11.80	50.91	28.93	4.30	27.06	48.23	51.77
United States	10.37	2.46	0.84	6.33	13.08	9.32	6.43	54.48	31.01	9.14	46.53	68.84	31.16
France	9.84	2.79	1.81	1.97	8.12	9.09				2.71			
Greece	3.47	0.49	0.20	0.78	3.90	5.99	53.23	32.63	18.70	2.86	10.76		
Japan	4.84	0.80		2.28	10.43	10.56	32.62	39.29	28.58	3.46	29.61		
Norway	8.05	2.12	1.12	3.20	7.01	7.52	19.38	54.84		2.58			
Netherlands	9.14	2.73	2.35	3.07	12.24	8.16	8.56	58.83	35.72	1.36	10.87		
Portugal	2.78	0.52	0.28	1.29	4.54	6.32	43.37	41.70		1.20			
Sweden	9.23	2.99		2.13	8.46	9.51	13.50	57.07	37.83	2.06	8.30		
Yugoslavia	5.90	1.28	0.98	1.07	4.54	1.64			22.66	1.43	6.53	14.06	85.94
Argentina	6.30	0.86		2.61	10.88	9.46			26.56	1.80	10.00	17.80	82.20
Chile	4.95			1.93	6.77	7.04	27.51	51.80	26.57	1.31	6.71	17.28	81.17
Korea (S)	2.36			1.28	2.60	8.21	65.63	19.92	9.44	0.55	4.21	10.69	88.92
Egypt	3.12	0.82	0.46	1.08	3.62	8.07	53.42	30.69	16.01	1.86	2.17	6.88	92.85
Ecuador	3.58	0.32		0.29	2.61	6.06	57.77	29.69	18.16	0.58	3.46	6.52	92.44
Ghana	2.34	0.48	0.36	0.52	1.69	13.50	61.09	20.86	15.36	0.17	1.61		
Honduras	2.52			0.59	2.22	3.95	65.89	24.84	10.16	0.19	2.56	4.11	95.91
Hong-Kong												20.84	79.19
Hungary	7.20	2.75	1.90	1.38	6.54	2.30			33.45	3.10	10.32		
Israël	12.08	2.06		5.17	11.93	7.95	13.46	49.42	28.50	4.28	19.32	40.33	59.76
Pakistan	1.38	0.06		0.44	1.81	4.35				0.33		2.81	97.19
Panama	5.08			2.38	6.08	5.46	50.10	30.90	13.78	1.76	5.94	14.65	85.07
Peru							48.73	34.96					
Philippines	2.26			3.52	2.73	6.02	59.58	25.89	14.81	3.20	6.20	16.80	83.20
Puerto Rico									39.80		30.19	42.16	57.84
Syria	2.18	0.11		0.61	2.89	8.00	48.30	37.93		0.77			
Uruguay	6.08			1.46	1.45	9.83	17.92	52.26	28.03	1.79	7.04	14.22	84.56
Zambia	2.40	0.48	0.18	0.46	1.45	0.52			1.18	0.45	2.93	5.25	94.75

Table G.3. NUMBER OF PERSONS IN AN OCCUPATIONAL CATEGORY j WITH AN EDUCATIONAL LEVEL k, AS A PROPORTION OF TOTAL NUMBER IN THIS CATEGORY L_{jk}/L_j (%)

COUNTRY	0A	9A	8A	1A	2A	3A	0B	9B	8B	1B	2B	3B	7B
Canada	31.04	37.43	4.73	9.71	1.44	2.75	82.00	78.58	65.65	47.98	44.28	32.48	12.00
United States	53.22	41.12	10.39	18.47	5.05	7.74	91.39	88.29	82.42	68.64	72.49	52.54	29.81
France	18.44	19.58	2.70	19.75	1.91	1.30							
Greece	56.60	53.89	1.37	27.37	5.52	1.19	79.00	88.33	72.60	72.63	76.85	17.91	3.98
Japan	25.77	31.31		17.57	10.34	3.30	85.55	92.41		66.75	75.51	38.48	19.01
Norway	23.50	31.88	1.27	13.35	0.58	0.46							
Netherlands	11.47	10.16	0.14	6.52	0.56	0.14	59.00	54.30	47.98	36.59	17.86	5.80	0.76
Portugal	33.01	47.11	6.39	5.82	1.16	0.24							
Sweden	18.08	14.60		12.74	0.36	0.55	58.12	60.49		37.48	5.40	4.30	1.90
Yugoslavia	18.90	23.34	1.47	17.86	1.00	1.17	68.00	23.25	62.04	56.70	1 30	9.88	2.00
Argentina	20.00	41.60		5.10	1.12	0.97	72.10	78.29		29.33	28.75	11.70	3.20
Chile	22.23			2.75	0.78	0.35	45.45			25.20	30.11	8.89	1.33
Korea (S)	8.41			2.62	4.36	0.51	46.16			18.24	31.11	5.24	3.28
Egypt	39.67	63.21	35.51	39.05	1.88	0.22	46.83	65.10	39.23	40.80	2.96	0.23	0.02
Ecuador	13.31	33.48		4.73	1.24	0.23	50.91	70.02		24.35	21.85	5.42	0.90
Ghana	4.45	5.07	0.54	8.76	0.53	0.03	34.70	22.63	14.44	37.83	17.39	0.60	0.53
Honduras	5.17			3.29	0.16	0.09	42.45			36.83	29.37	1.55	0.59
Hong-Kong													
Hungary	33.04	23.73	5.60	17.08	4.40	0.40	70.48	63.70	52.99	47.21	40.20	5.21	3.15
Israël	21.19	32.56		9.95	4.88	1.45	61.30	70.25		24.33	31.26	11.33	6.96
Pakistan	11.88	29.33		11.28	4.93	0.30							
Panama	21.81			10.50	4.09	0.92	44.81			28.15	26.06	6.67	3.64
Peru													
Philippines	56.54			6.70	28.97	3.50	86.41			12.30	54.55	7.31	2.84
Puerto Rico							95.90			46.33	79.75	35.14	19.01
Syria	23.33	79.07		26.98	1.07	0.23							
Uruguay	22.81			6.21	1.45	0.41	54.21			23.45	16.71	5.21	0.90
Zambia	14.69	24.28	4.11	10.81	1.29	1.79	40.44	71.02	52.05	73.24	49.74	43.68	30.32

Table G.3bis. NUMBER OF PERSONS IN AN OCCUPATIONAL CATEGORY j WITH AN EDUCATIONAL LEVEL k, AS A PROPORTION OF TOTAL NUMBER IN THIS CATEGORY: Ljk/Lj (%)

COUNTRY	0C	1C	2C	3C	7C	0D	1D	2D	3D	7D
Canada	92.28	68.95	74.83	60.08	31.85	7.72	31.05	25.17	39.92	68.15
United States	97.12	85.41	91.12	78.25	56.19	2.83	14.59	8.88	21.75	43.81
France										
Greece										
Japan										
Norway										
Netherlands										
Portugal										
Sweden										
Yugoslavia	77.16	71.09	37.17	24.96	31.20	22.86	28.91	62.83	75.04	68.80
Argentina	78.40	36.61	41.40	19.40	10.40	21.60	63.39	58.60	80.60	89.60
Chile	61.84	54.36	72.98	29.70	9.60	36.13	43.73	25.80	68.78	89.11
Korea (S)	79.30	38.54	63.59	15.05	11.89	20.39	[illegible]	36.19	84.54	87.76
Egypt	95.99	71.51	47.48	2.39	1.88	3.39	27.99	52.11	97.42	97.87
Ecuador	66.72	36.17	45.20	13.46	4.07	24.03	57.45	49.70	85.03	94.28
Ghana										
Honduras	54.27	49.55	53.92	8.43	1.84	45.73	50.90	46.16	91.92	98.04
Hong-Kong	82.17	73.16	59.36	19.63	8.66	17.83	26.81	40.77	80.37	91.34
Hungary										
Israel	75.16	68.30	70.69	31.34	24.32	24.02	30.73	28.66	62.32	67.47
Pakistan	52.86	34.46	57.32	7.86	2.84	47.14	65.58	42.68	92.14	97.16
Panama	78.98	54.62	62.33	21.43	15.66	20.11	44.82	37.23	78.11	83.47
Peru										
Philippines	95.71	32.50	84.11	26.33	19.27	4.29	67.50	15.88	73.67	80.73
Puerto Rico	97.70	56.16	88.09	50.97	36.15	2.30	43.84	11.91	49.02	63.85
Syria										
Uruguay	66.45	42.76	37.29	14.91	5.99	29.42	56.55	61.90	84.68	93.19
Zambia	64.34	92.57	85.51	80.19	81.16	35.63	7.30	14.49	19.[illegible]	18.84

Table G. 4. NUMBER OF PERSONS IN AN OCCUPATIONAL CATEGORY j WITH AN EDUCATIONAL LEVEL k, AS A PROPORTION OF TOTAL EMPLOYMENT: Ljk/L (%)

COUNTRY	0A	9A	8A	1A	2A	3A	0B	9B	8B	1B	2B	3B	7B
Canada	3.02	0.76	0.04	0.52	0.19	0.26	7.98	1.60	0.61	2.57	5.71	3.03	3.47
United States	5.52	1.01	0.09	1.17	0.66	0.72	9.48	2.17	0.69	4.35	9.48	4.90	9.24
France	1.81	0.55	0.05	0.39	0.16	0.12							
Greece	1.97	0.26		0.21	0.22	0.07	2.74	0.4[illegible]	0.14	0.57	3.0[illegible]	1.07	0.75
Japan	1.25	0.25		0.40	1.08	0.35	4.14	0.74		1.52	7.87	4.06	5.43
Norway	1.89	0.68	0.01	0.43	0.04	0.03							
Netherlands	1.05	0.28		0.20	0.07	0.01	5.39	1.48	1.13	1.12	2.19	0.47	0.27
Portugal	0.92	0.24	0.02	0.08	0.05	0.02							
Sweden	1.67	0.44		0.27	0.03	0.05	5.36	1.81		0.80	0.46	0.41	0.72
Yugoslavia	1.12	0.30	0.01	0.19	0.05	0.02	4.02	0.30	0.61	0.61	0.74	0.16	0.45
Argentina	1.26	0.36		0.13	0.12	0.09	4.54	0.67		0.76	3.13	1.11	0.85
Chile	1.10			0.05	0.66	0.02	2.25			0.49	2.04	0.63	0.35
Korea (S)	0.20			0.03	0.11	0.04	1.09			0.23	0.81	0.43	0.31
Egypt	1.24	0.52	0.16	0.42	0.07	0.02	1.46	0.33	0.18	0.44	0.11	0.02	0.00
Ecuador	0.48	0.11		0.01	0.03	0.01	1.82	0.22		0.07	0.57	0.33	0.16
Ghana	0.10	0.02	0.00	0.05	0.01	0.00	0.81	0.11	0.05	0.20	0.29	0.08	0.08
Honduras	0.13			0.02	0.00	0.00	1.07			0.22	0.65	0.18	0.06
Hong-Kong													
Hungary	2.38	0.65	0.11	0.24	0.29	0.01	5.07	1.75	1.01	0.65	2.63	0.12	1.05
Israel	2.56	0.67		0.51	0.58	0.12	7.41	1.45		1.26	3.73	0.90	98
Pakistan	0.16	0.02		0.05	0.09	0.01							
Panama	1.11			0.25	0.25	0.05	2.28			0.67	1.58	0.36	0.50
Peru													
Philippines	1.28			0.24	0.79	0.21	1.95			0.43	1.49	0.44	0.42
Puerto Rico							6.87			3.61	6.64	2.52	7.57
Syria	0.51	0.09		0.16	0.03	0.02							
Uruguay	1.39			0.09	0.18	0.04	3.29			0.34	2.08	0.51	0.25
Zambia	0.35	0.12	0.01	0.05	0.02	0.01	0.57	0.34	0.09	0.34	0.72	0.23	0.36

Table G. 4bis. NUMBER OF PERSONS IN AN OCCUPATIONAL CATEGORY j WITH AN EDUCATIONAL LEVEL k, AS A PROPORTION OF TOTAL EMPLOYMENT: Ljk/L (%)

COUNTRY	0C	1C	2C	3C	7C	0D	1D	2D	3D	7D
Canada	8.98	3.69	9.64	5.60	9.21	0.75	1.66	3.24	3.72	19.72
United States	10.07	5.41	11.91	7.29	17.42	0.30	0.92	1.16	2.03	13.58
France										
Greece										
Japan										
Norway										
Netherlands										
Portugal										
Sweden										
Yugoslavia	4.56	0.76	1.69	0.41	7.07	1.35	0.31	2.85	1.25	15.59
Argentina	4.94	0.95	4.50	1.84	2.76	1.36	1.65	6.17	7.62	23.80
Chile	3.06	1.05	4.94	2.09	2.55	1.79	0.84	1.75	4.84	23.68
Korea (S)	1.87	0.49	1.65	1.24	1.12	0.48	0.78	6.94	6.94	8.28
Egypt	3.00	0.77	1.72	0.19	0.30	0.11	0.30	1.89	7.86	15.67
Ecuador	2.39	0.11	1.18	0.82	0.74	0.86	0.17	1.30	5.15	17.12
Ghana										
Honduras	1.37	0.29	1.20	0.33	0.19	1.15	0.30	1.03	3.63	9.97
Hong-Kong	4.18	2.43	3.85	2.90	4.08	0.91	0.89	2.65	11.87	43.05
Hungary										
Israël	9.08	3.53	8.44	2.48	6.93	2.90	1.58	3.42	4.95	19.22
Pakistan	0.73	0.15	1.04	0.34	0.31	0.65	0.29	0.77	4.01	10.61
Panama	4.01	1.39	3.79	1.17	2.16	1.02	1.07	2.26	4.26	11.50
Peru										
Philippines	2.16	1.15	2.29	1.58	2.85	0.10	2.38	0.43	4.43	11.96
Puerto Rico	7.00	4.38	7.34	3.65	14.39	0.16	3.42	0.99	3.51	25.41
Syria										
Uruguay	4.04	0.62	4.64	1.47	1.68	1.79	0.82	7.70	8.33	26.12
Zambia	1.54	0.42	1.24	0.42	0.96	0.85	0.03	0.21	0.10	0.22

Table G. 5. MEAN YEARS OF SCHOOLING OF TOTAL ACTIVE POPULATION (E) AND OF EACH OCCUPATIONAL CATEGORY

COUNTRY	E	0E	1E	2E	3E	4E	5E
Canada	9.6	13.7	11.2	11.1	10.3	7.5	8.5
United States	11.8	15.3	12.9	12.4	11.9	10.7	10.9
France	7.0	13.3	12.4	12.1	8.2	5.7	7.0
Greece	10.3	13.9	12.6	12.6	10.6	9.3	10.0
Japan	7.6	10.9	9.4	8.0	7.4	7.1	7.2
Norway	9.9	12.2	11.1	10.0	9.7	9.5	9.5
Netherlands	2.8	10.6	5.2	6.0	3.4	1.8	2.8
Portugal	9.8	11.5	11.3	9.8	9.7	9.5	9.5
Sweden							
Yugoslavia							
Argentina	5.3	10.0	8.9	10.2	6.9	2.7	5.3
Chile	4.0	11.5	7.6	10.2	4.9	2.9	5.2
Korea (S)	2.4	12.9	11.1	8.3	2.6	1.0	2.5
Egypt	3.9	11.6	8.8	9.0	5.8	2.2	4.4
Ecuador	1.2	7.9	7.7	8.1	0.9	0.5	2.1
Ghana	2.6	9.7	7.9	8.4	4.2	1.1	2.7
Honduras							
Hong-Kong							
Hungary	8.5	13.0			7.1	6.3	7.2
Israël							
Pakistan							
Panama	5.0	12.1	9.7	10.0	6.5	2.4	5.6
Peru	3.1	10.2	7.2	8.2	4.3	1.5	2.6
Philippines	5.2	13.3	6.7	11.3	6.1	4.1	5.5
Puerto Rico							
Syria	1.3	10.9	7.1	6.8	1.1	0.4	1.0
Uruguay	5.1	11.3	7.3	7.9	5.6	3.1	4.2
Zambia							

Table G. 6. OCCUPATIONAL COEFFICIENTS (Lj/X): NUMBER OF PERSONS IN A CATEGORY j FOR ONE MILLION DOLLARS OF OUTPUT; EDUCATIONAL COEFFICIENTS (Lk/X): NUMBER OF PERSONS WITH AN EDUCATIONAL LEVEL k FOR ONE MILLION DOLLARS OF OUTPUT

COUNTRY	Lj/X							Lk/X			
	0	9	8	1	2	3	7	A	B	C	D
Canada	19.65	4.12	1.89	10.81	26.04	18.84	58.45	8.68	54.68	97.43	104.59
United States	15.42	3.66	1.25	9.42	19.45	13.86	46.12	13.59	69.21	102.38	46.35
France	30.09	8.54	5.54	6.02	24.84	27.78		8.28			
Greece	40.25	5.70	2.31	9.02	45.25	69.43	216.80	33.13	124.78		
Japan	58.27	9.62		27.47	125.54	127.12	344.03	41.63	356.52		
Norway	27.53	7.25	3.82	10.93	23.98	25.71		8.83			
Netherlands	37.12	11.07	9.55	12.47	49.72	33.16	145.09	5.52	44.16		
Portugal	41.75	7.80	4.19	19.40	68.29	94.94		18.09			
Sweden	27.10	8.79		6.26	24.86	27.93	111.14	6.06	24.38		
Yugoslavia	103.73	22.56	17.14	18.87	79.72	28.77	397.98	25.19	114.74	246.97	1,509.65
Argentina	46.95	6.39		19.41	81.01	70.45	197.85	13.41	74.49	132.58	612.29
Chile	27.27			10.65	37.33	38.81	146.40	7.20	36.96	95.22	447.25
Korea (S)	57.79			31.32	63.68	201.24	231.22	13.44	103.11	261.96	2,178.87
Egypt	60.10	15.72	8.79	20.84	69.68	155.16	307.98	35.71	41.72	132.29	1,785.54
Ecuador	63.95	5.64		5.22	46.65	108.37	324.74	10.40	61.80	116.66	1,652.80
Ghana	45.70	9.32	7.07	10.17	33.02	263.22	299.38	3.30	31.30		
Honduras	39.07			9.13	34.51	61.23	157.73	2.95	39.67	63.74	1,488.25
Hong-Kong										247.31	939.68
Hungary	54.01	20.63	14.28	10.35	49.03	17.29	250.98	23.25	77.42		
Israël	33.19	5.66		14.20	32.78	21.83	78.29	11.76	53.07	110.79	139.44
Pakistan	54.63	2.28		17.38	71.72	171.87		13.21		111.07	3,840.67
Panama	38.93			18.26	46.57	41.78	105.50	13.48	45.45	112.15	651.21
Peru											
Philippines	58.48			86.54	67.00	147.62	363.84	78.60	152.28	412.64	2,043.58
Puerto Rico							111.16		84.31	175.75	161.54
Syria	35.78	1.90		10.28	50.30	134.82		13.03			
Uruguay	45.01			10.79	92.19	72.84	207.59	13.24	72.16	105.36	626.34
Zambia	22.72	4.50	1.72	4.35	13.70	4.92	397.98	4.29	27.72	49.68	897.32

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Table G. 7. OCCUPATIONAL/EDUCATIONAL COEFFICIENTS: Ljk/X; NUMBER OF PERSONS OF A CATEGORY j WITH [illegible] EDUCATIONAL LEVEL k FOR ONE MILLION DOLLARS OF OUTPUT

COUNTRY	0A	9A	8A	1A	2A	3A	0B	9B	8B	1B	2B	3B	7B
Canada	6.10	1.54	0.09	1.05	0.37	0.52	16.12	3.24	1.24	5.18	11.53	6.12	7.01
United States	8.21	1.51	0.13	1.74	0.98	1.07	14.10	3.22	1.03	6.46	14.10	7.26	13.75
France	5.55	1.67	0.15	1.19	0.47	0.36							
Greece	22.78	3.07	0.03	2.47	2.50	0.82	31.80	5.03	1.68	6.55	34.78	12.44	8.64
Japan	15.01	3.01		4.83	12.98	4.20	49.85	8.89		18.34	94.79	48.91	65.39
Norway	6.47	2.31	0.05	1.46	0.14	0.12							
Netherlands	4.26	1.12	0.01	0.81	0.28	0.05	21.90	6.01	4.58	4.56	8.88	1.92	1.10
Portugal	13.78	3.68	0.27	1.13	0.79	0.23							
Sweden	4.90	1.28		0.80	0.09	0.15	15.76	5.32		2.35	1.34	1.20	2.11
Yugoslavia	19.61	5.27	0.25	3.37	0.80	0.34	70.53	5.24	10.64	10.70	12.99	2.84	7.96
Argentina	9.39	2.66		0.99	0.90	0.69	33.85	5.00		5.69	23.29	8.24	6.33
Chile	6.06			0.29	0.29	0.13	12.39			2.68	11.24	3.45	1.94
Korea (S)	4.86			0.82	2.78	1.04	26.68			5.71	19.81	10.55	7.59
Egypt	23.84	9.94	3.12	8.14	1.31	0.34	28.15	10.24	3.45	8.50	2.06	0.36	0.06
Ecuador	8.51	1.89		0.25	0.58	0.25	32.55	3.95		1.27	10.19	5.86	2.91
Ghana	2.03	0.47	0.04	0.89	0.18	0.09	15.86	2.11	1.02	3.85	5.74	1.58	1.57
Honduras	2.02			0.30	0.05	0.05	16.58			3.36	10.14	2.79	0.93
Hong-Kong													
Hungary	17.85	4.90	0.80	1.77	2.16	0.07	38.07	13.14	7.56	4.89	19.71	0.90	7.91
Israel	7.03	1.84		1.41	1.60	0.32	20.34	3.97		3.45	10.25	2.47	5.45
Pakistan	9.49	0.67		1.96	3.54	0.51							
Panama	8.49			1.92	1.91	0.38	17.44			5.14	12.14	2.79	3.84
Peru													
Philippines	31.37			5.80	19.41	5.18	47.94			10.64	36.54	10.80	10.33
Puerto Rico							19.20			10.09	18.55	7.03	21.14
Syria	8.58	1.50		2.77	0.54	0.31							
Uruguay	10.27			0.67	1.34	0.30	24.40			2.53	15.40	3.79	1.86
Zambia	3.34	1.09	0.07	0.47	0.18	0.09	9.19	3.20	0.89	3.18	6.82	2.15	3.38

Table G. 7bis. OCCUPATIONAL/EDUCATIONAL COEFFICIENTS: Ljk/X;
NUMBER OF PERSONS OF A CATEGORY j WITH AN EDUCATIONAL LEVEL k FOR ONE MILLION DOLLARS OF OUTPUT

COUNTRY	0C	1C	2C	3C	7C	0D	1D	2D	3D	7D
Canada	18.14	7.45	19.48	11.32	18.61	1.52	3.36	6.56	7.52	39.83
United States	14.98	8.04	17.72	10.85	25.91	0.44	1.37	1.73	3.02	20.20
France										
Greece										
Japan										
Norway										
Netherlands										
Portugal										
Sweden										
Yugoslavia	80.03	13.42	29.63	7.18	124.18	23.72	5.45	50.08	21.59	273.80
Argentina	36.81	7.10	33.54	13.67	20.58	10.14	12.30	47.47	56.78	177.27
Chile	16.81	5.79	27.25	11.52	14.05	9.85	4.66	9.63	26.69	130.46
Korea (S)	45.83	12.07	40.50	30.29	27.50	1.79	19.14	23.05	170.12	202.93
Egypt	57.69	14.90	33.08	3.71	5.78	2.04	5.83	36.31	151.16	301.42
Ecuador	42.66	1.89	21.09	14.59	13.22	15.36	3.00	23.18	92.15	306.17
Ghana										
Honduras	21.20	4.52	18.61	5.16	2.90	17.87	4.64	15.93	56.28	154.64
Hong-Kong	49.57	28.82	45.70	34.41	48.42	10.75	10.56	31.40	140.86	510.86
Hungary										
Israël	24.94	9.70	23.17	6.84	19.04	7.97	4.36	9.39	13.60	52.82
Pakistan	28.88	5.99	41.11	13.51	12.27	25.75	11.40	30.61	158.36	419.10
Panama	30.74	9.97	29.03	8.95	16.52	7.83	8.18	17.34	32.63	88.06
Peru										
Philippines	53.10	28.12	56.35	38.92	70.11	2.38	58.41	10.64	108.90	293.71
Puerto Rico	19.56	12.23	20.49	10.20	40.18	0.46	9.55	2.77	9.81	70.98
Syria										
Uruguay	29.91	4.61	34.37	10.86	12.43	13.24	6.10	57.07	61.68	193.45
Zambia	14.62	4.02	11.72	3.95	9.06	8.10	0.32	1.99	0.98	2.10

Annex H

BASIC DATA USED FOR THE SECTORAL/ EDUCATIONAL ANALYSIS

Economic sectors are indicated by subscript i and educational levels by subscript k :

a) Each economic sector i is also represented by a letter:

Manufacturing	M
Commerce	C
Transport	T
Services	S

b) Each educational level k is also represented by a letter:

University Degree and above	A
Complete Secondary Schooling and above	B
More thar Eight Years of Schooling	C
Eight Years of Schooling or less	D

NOTE: The subscript for the economic sector is always shown before the educational subscript. Thus for example Lik/Li in column MC represents the number of people in sector M (Manufacturing) with educational level C (more than eight years of schooling) as a proportion of employment in sector M. Thus for Israël, the proportion of employment in Manufacturing with more than eight years of schooling is 34.08 % (Table H.1).

SOURCES:

- See the notes to Table G.1 for the economic data of each sector;
- The data on the levels of education of economic sectors are drawn from Statistics of the Occupational and Educational Structure of the Labour Force in 53 Countries, OECD, Paris 1969.

Table H.1. MANUFACTURING

- Basic economic data[1]
- Number of persons working in sector i with an educational level k, as a proportion of { sector employment: Lik/Li ; total employment: Lik/L }
- Number of persons working in sector i with an educational level k for 10^6 U.S. dollars of sector output: Lik/Xi

COUNTRY	BASIC ECONOMIC DATA				Lik/Li				Lik/L				Lik/Xi			
	Xi/Li	G	Ei/Xi	Li/L	MA	MB	MC	MD	MA	MB	MC	MD	MA	MB	MC	MD
Belgium	2,590	3,853	95.2	36.05	0.99	6.36			0.36	2.29			3.81	24.55		
United States	6,850	7,834	10.2	27.01	5.94	41.79	65.94	34.06	1.60	11.29	17.91	9.20	8.67	61.02	96.26	49.74
Japan	1,020	965	39.8	21.73	3.75	29.33			0.81	6.37			36.82	288.08		
Norway	3,050	2,477	49.9	25.47	1.23				0.31				4.02			
Netherlands	2,600	2,675	64.5	29.92	0.57				0.17				2.19			
Sweden	3,390	2,995	42.7	34.18	0.89				0.30				2.62			
Yugoslavia	1,460	794	19.4	11.91	1.02	7.51	40.16	59.84	0.12	0.89	4.78	7.13	6.99	51.40	274.72	409.30
Argentina	1,600	1,033	2.5	27.17	0.90	6.10	16.20	83.80	0.24	1.66	4.40	22.77	5.61	38.05	101.05	522.67
Egypt	810	235	12.2	9.48	0.84	0.92	5.15	94.55	0.08	0.09	0.49	8.96	10.39	11.36	63.56	1,166.02
Hungary	3,150	2,180	13.9	24.24	2.03	10.58			0.49	2.57			6.45	33.63		
Israël	3,480	1,122	26.0	23.19	2.15	12.51	34.08	60.87	0.50	2.90	7.90	14.11	6.18	35.93	97.91	174.87
Pakistan	285	56	15.4	8.19	0.28		4.72	95.28	0.02		0.39	7.81	9.82		165.57	3,340.43
Panama	2,220	478	0.4	7.37	1.09	6.88	22.64	77.45	0.08	0.51	1.67	5.71	4.90	31.02	102.04	348.98
Philippines	810	149	3.6	11.85	2.10	5.40	21.40	78.60	0.25	0.64	2.54	9.31	25.94	66.70	264.37	970.92
Poland	3,110	2,995	6.7	19.73	1.97	9.56			0.39	1.89			6.32	30.73		
Syria	810	286	18.4	11.74	0.20				0.02				2.53			
Uruguay	1,330	800	0.1	21.22	0.76	3.65	12.45	88.02	0.16	0.77	2.64	18.67	5.71	27.50	93.93	663.93
Zambia	1,730	457	9.0	3.88	0.48	8.55	15.04	84.83	0.02	0.33	0.58	3.29	2.78	49.44	87.04	490.74

1. Xi/Li : Output per employed worker in U.S. dollars,
G : Energy consumption in Kwh,
Ei/Xi : Percentage of exports in output,
Li/L : Sectoral structure of employment (in %).

Table H.2. COMMERCE

{Labour productivity in U.S. dollars (Xi/Li) and sectoral structure of employment (Li/L)
Number of persons working in sector i with an educational level k, as a proportion of {sector employment: Lik/Li / total employment: Lik/L
Number of persons working in sector i with an educational level k for 10^6 U.S. dollars of sector output: Lik/Xi}

COUNTRY	Xi/Li	Li/L	Lik/Li				Lik/L				Lik/Xi			
			CA	CB	CC	CD	CA	CB	CC	CD	CA	CB	CC	CD
Belgium	4,630	15.36	2.35	11.59			0.36	1.78			5.07	25.03		
United States	8,440	19.38	6.84	54.16	78.72	21.28	1.33	10.49	15.25	4.12	8.11	64.18	93.29	25.22
Japan	980	17.55	4.46	42.68			0.78	7.49			45.31	433.91		
Norway	4,070	13.28	1.81				0.24				4.45			
Netherlands	2,770	16.29	0.70				0.11				2.51			
Sweden	5,520	13.52	1.24				0.17				2.25			
Yugoslavia	1,850	3.18	1.29	9.85	32.54	67.46	0.04	0.31	1.04	2.15	7.01	53.33	176.22	365.41
Argentina	1,930	14.85	1.50	11.00	24.20	75.80	0.22	1.63	3.59	11.26	7.79	57.08	125.58	393.36
Egypt	1,260	8.47	1.51	1.61	6.61	93.16	0.13	0.14	0.56	7.89	12.57	13.40	55.11	777.25
Hungary		6.69	3.22	16.98			0.22	1.14						
Israël	3,810	11.84	3.40	19.03	49.36	50.55	0.40	2.25	5.85	5.99	8.94	50.00	129.69	132.81
Pakistan	950	4.92	0.65		9.75	97.04	0.03		0.48	4.78	6.83		102.64	1,022.00
Panama	2,910	9.19	2.95	13.09	33.82	66.18	0.27	1.20	3.11	6.08	10.12	45.00	116.25	227.50
Philippines	1,230	9.54	5.80	11.00	29.10	70.90	0.55	1.05	2.77	6.76	47.27	89.60	237.00	577.55
Poland							0.14	1.10						
Syria	1,170	8.52	0.85				0.07				7.20			
Uruguay	2,350	13.25	1.36	9.55	23.20	76.80	0.18	1.27	3.07	10.18	5.81	40.65	98.71	326.77
Zambia	4,920	3.03	0.96	19.58	31.54	68.40	0.03	0.59	0.96	2.07	1.96	39.83	64.17	139.17

Table H.3. TRANSPORT

Basic economic data[1]
Number of persons working in sector i with an educational level k, as a proportion of {sector employment: Lik/Li / total employment: Lik/L}
Number of persons working in sector i with an educational level k for 10^6 U.S. dollars of sector output: Lik/Xi

COUNTRY	BASIC ECONOMIC DATA			Lik/Li				Lik/L				Lik/Xi			
	Xi/Li	Li/L	Y	TP	TB	TC	TD	TA	TB	TC	TD	TA	TB	TC	TD
Belgium	3,100	7.07	53.62	0.66	7.70			0.05	0.54			2.13	24.85		
United States	7,100	5.47	179.65	3.40	45.52	69.29	30.71	0.19	2.49	3.79	1.68	4.79	64.09	97.56	43.23
Japan	1,140	5.04	31.65	3.41	40.05			0.17	2.02			30.04	352.80		
Norway	4,380	11.91	80.63	0.60				0.07				1.38			
Netherlands	3,280	6.91	41.38	0.37				0.03				1.13			
Sweden	4,110	7.46	35.54	0.41				0.03				1.01			
Yugoslavia	1,320	3.00	4.51	0.78	7.88	22.90	77.10	0.02	0.24	0.69	2.31	5.91	59.70	173.48	584.09
Argentina	1,500	6.83	49.36	0.40	4.70	12.81	87.19	0.03	0.32	0.88	5.96	2.68	31.43	85.63	583.02
Egypt	1,390	3.47	2.64	1.94	1.86	10.48	89.70	0.07	0.06	0.36	3.11	13.92	13.36	75.21	643.98
Hungary	1,100	6.08	6.42	1.35	11.19			0.08	0.68			12.31	102.00		
Israël	4,370	6.25	36.20	1.80	14.52	39.90	54.10	0.11	0.91	2.49	3.38	4.12	33.20	91.24	123.71
Pakistan	950	1.75	1.03	0.74		10.56	89.45	0.01		0.18	1.56	7.72		110.64	937.20
Panama	2,450	2.86	26.05	1.40	8.05	24.50	75.85	0.04	0.23	0.70	2.17	5.71	32.86	100.00	309.52
Philippines	470	3.40	8.00	2.80	7.80	30.60	69.40	0.10	0.26	1.04	2.36	61.67	165.87	650.67	1,476.00
Poland	1,610	5.12	12.42	0.91	9.21			0.05	0.47			5.69	57.33		
Syria	1,970	3.67	12.31	0.41				0.02				2.08			
Uruguay	1,760	6.18	82.57	0.33	3.25	10.57	89.43	0.02	0.20	0.65	5.52	1.85	18.52	60.19	509.26
Zambia	2,780	1.43	14.15	0.35	10.23	22.55	77.19		0.15	0.32	1.10	1.25	36.87	81.25	278.12

1. Xi/Li : Labour productivity in U.S. dollars.
Li/L : Sectoral structure of employment.
Y : Number of commercial vehicles per employed worker.

Table H.4. SERVICES {Social Index (Is) and sectoral structure of employment (Li/L) / Number of persons working in sector i with an educational level k, as a proportion of {sector employment: Lik/Li / total employment: Lik/L

COUNTRY			Lik/Li				Lik/L			
	Is	Li/L	SA	SB	SC	SD	SA	SB	SC	SD
Belgium	70	22.29	6.29	29.68			1.40	6.62		
United States	100	28.31	18.57	55.84	75.32	24.68	5.26	15.81	21.32	6.99
Japan	75	14.88	9.68	54.17			1.44	8.06		
Norway	70	18.83	9.42				1.77			
Netherlands	70	23.50	4.27				1.00			
Sweden	79	19.83	7.17				1.42			
Yugoslavia	29	8.73	9.44	36.58	49.22	50.78	0.82	3.19	4.30	4.43
Argentina	50	23.46	6.41	22.80	32.84	67.16	1.50	5.35	7.70	15.75
Egypt	14	18.01	7.12	8.48	22.78	76.47	1.28	1.53	4.10	13.77
Hungary	50	10.42	16.16	36.65			1.68	3.82		
Israël	67	30.54	9.05	32.90	54.05	40.36	2.77	10.05	16.51	12.33
Pakistan	8	8.19	3.14		20.15	79.85	0.26		1.65	6.54
Panama	33	24.99	4.76	13.55	31.01	68.97	1.19	3.39	7.75	17.23
Philippines	19	10.87	18.64	31.31	47.98	52.02	2.03	3.40	5.21	5.65
Poland	49	8.14	15.83	48.81			1.29	3.97		
Syria	14	13.19	4.68				0.62			
Uruguay	57	28.00	4.41	14.57	24.79	75.21	1.24	4.08	6.94	21.05
Zambia	9	9.52	3.00	10.64	19.03	80.94	0.29	1.01	1.81	7.71

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